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Flood resilient communities – managing the consequences of flooding

CRUE Research Report No 1: Flood Incident Management – A FRAMEwork for improvement – FIM FRAME
The Effectiveness and Robustness of Emergency Plans for Floods

Prepared by the Joint Project Consortium consisting of

Project partner #1, HR Wallingford, UK

Project partner #2, Deltares, The Netherlands

Project partner #3, Laboratoire Central Des Pont Et Chaussées, France

Project partner #4, University Montpellier III, France

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Flood Incident Management – A FRAMEwork for improvement

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The Effectiveness and Robustness of Emergency Plans for Floods

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Flood resilient communities – managing the consequences of flooding

Flood Incident Management – A FRAMEwork for improvement – FIM FRAME
The Effectiveness and Robustness of Emergency Plans for Floods

CRUE Research Report No I-1

Prepared by

Project partner #1, HR Wallingford, UK

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CRUE Funding Initiative on FRM

John Goudie
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Summary

This report has been produced as part of Work Package 1 (WP1) of the ERA NET CRUE research project entitled Flood Incident Management – A FRAMEwork for improvement (FIM FRAME). The following activities were carried out within the framework of WP1:

- A comparison of flood emergency planning practices in England and Wales, France and the Netherlands;
- Development of metrics to assess the completeness and the level of detail of a flood emergency plan;
- Review of flood emergency plans in England and Wales, France and the Netherlands to gain an insight into their current status, to identify where the emphases within the plans lie and to enable a comparison between the countries;
- An internet survey of stakeholders responsible or involved in producing emergency plans for floods to assess their requirements for flood emergency plans;

From the research it was concluded that there is often a lack of homogeneity between the emergency plans that have been reviewed. Although to a certain extent this is to be expected given the different nature of the flood risk in the areas covered by the plans that were reviewed. However, the same information for example was often expressed in significantly different levels of detail. Many of the plans reviewed had what could be classed as a large amount of generic “cut and paste” text on flooding but had limited text on local or regionally specific issues. It would appear from the research that many stakeholders would like more specific information especially with regards to the nature of the flood hazard and the accessibility of roads to emergency services and other vehicles for different flooding scenarios.

The metrics developed as part of the research proved to be a useful tool for assessing emergency plans, for identifying strong points and weaknesses, as well as providing a basis for comparison of the plans. The following conclusions can be reached regarding emergency plans in the Netherlands:

- Metrics such as “plan activation”; “actions, roles and responsibilities”, “flood warning” and “target audience and updating”; and “aims and objectives” were well covered in most of the plans reviewed
- In all three countries there appeared to be a lack of information in plans on critical infrastructure
- There was great emphasis given by the stakeholders on having more information the accessibility of roads during flood events
- The Netherlands had the best score relating to risk to people in emergency plans. In France and England and Wales there was “room for improvement” in the treatment of risk to people, particularly vulnerable groups
- There is a difference in the way that flood hazard is depicted in emergency plans between England and Wales, France and the Netherlands.

Contents

1 Introduction

1.1 Background to the research

This report has been produced as part of Work Package 1 (WP1) of the ERA NET CRUE research project entitled Flood Incident Management – A FRAMEwork for improvement (FIM FRAME).

FIM FRAME is a 24 month project research project. The project is funded by:

- The joint Department for Environment, Food and Rural Affairs (Defra)/Environment Agency Flood And Coastal Erosion Risk Management (FCERM) Research and Development Programme and
- The Ministère de l'Ecologie, de l'Energie, du Développement Durable et de la Mer, en charge des Technologies Vertes et des Négociations sur le Climat (MEEDDM).

The research is being undertaken in the UK, France and the Netherlands. The project partners are:

- HR Wallingford, UK – Project coordinator;
- Deltares, The Netherlands;
- Gestion des Sociétés, des Territoires et des Risques (GESTER), University of Montpellier III, France;
- Laboratoire Central des Ponts et Chaussées (LCPC), Nantes, France.

The objectives of the research can be summarised as follows:

- To assess the "effectiveness" of a sample of current flood emergency plans in the UK, The Netherlands and France and to assess methods by which the plans can be improved;
- To evaluate the current tools and technical systems that are used to inform flood emergency plans and the ability of these tools to support future flood event emergency planning with the main aim of reducing residual risk (i.e. primarily loss of life);
- To establish how currently available tools (e.g. guidelines, models) can be used to improve emergency management plans for floods and whether there are any gaps in the tools that are available;
- To provide a framework by which flood incident management can be improved that will be tested in a number of case studies.

The research has been carried out in six Work Packages (WPs) as follows:

- WP1 - Effectiveness and robustness of flood event management plans;
- WP2 - Comparison of currently available tools for the emergency planning of floods;
- WP3 - Development of framework to improve flood event management;
- WP4 - Case studies utilising the developed framework to improve emergency plans working together with emergency responders, emergency planners and other stakeholders;
- WP5 - Dissemination of the results;
- WP6 - Management and coordination.

The relationship between the six Work Packages is shown in Figure 1.1.

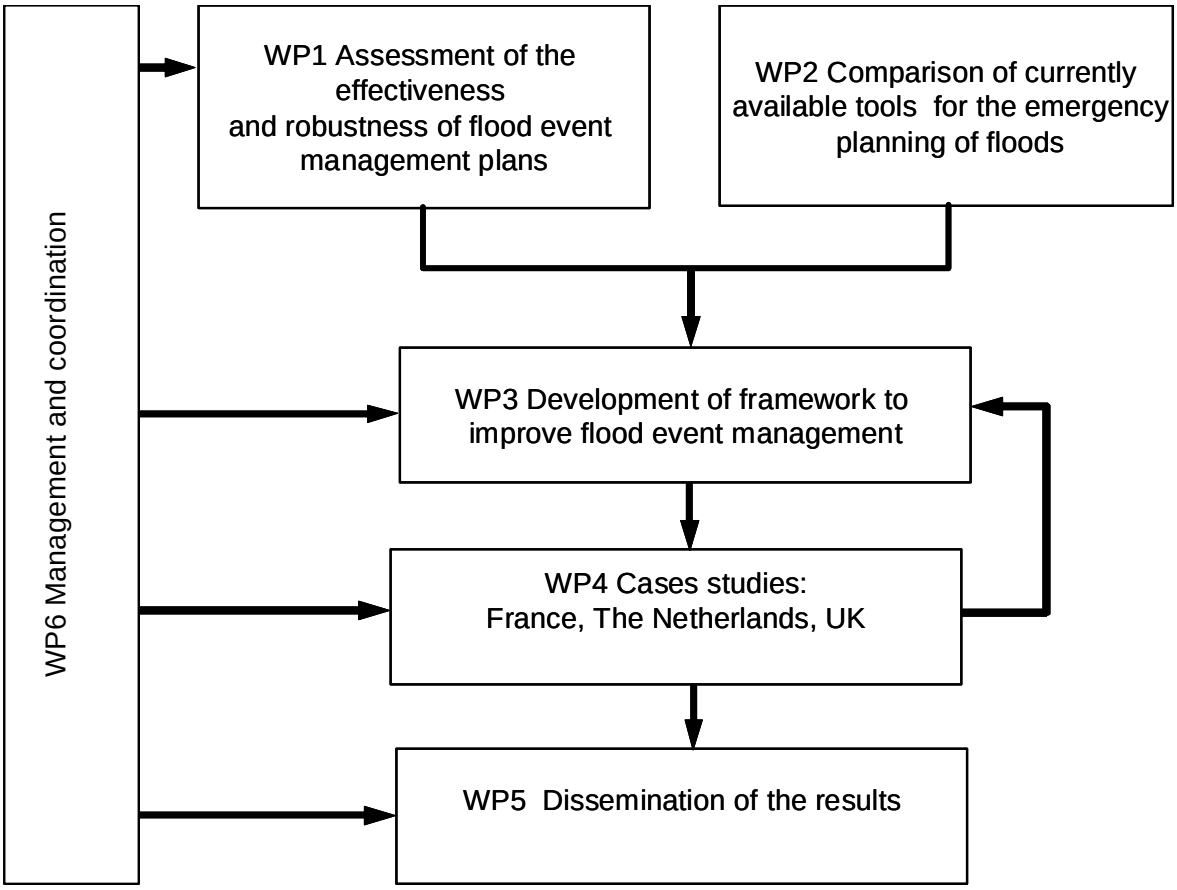


Figure 1.1 Relationship between the FIM FRAME Work Packages

1.2 Background to Work Package 1 (WP1) of FIM FRAME

The overall effectiveness of an emergency response to a flood is a difficult entity to measure. Every flood is different and every response is different. There is no standardised method for obtaining data and information on the response to an actual flood. Furthermore, relying on data sets of disasters collected from various agencies leads to ambiguous terms, inconsistent and incomplete data.

There are currently significant weaknesses in emergency plans for floods. For example, in the UK in 2006 it was found that:

- 30% of emergency plans have not been published or communicated to people in the area;
- 30% of emergency plans have not been seen or validated by the Environment Agency;
- Police plans do not have flood evacuation routes identified and 20% do not include traffic management measures in their evacuation plans at all.

In the Netherlands, the Taskforce Management for Floods (TMO) was initiated in 2006. The objective of the TMO was to improve the flood preparedness in the Netherlands. The TMO was concluded in 2008

with a national exercise simulating the 'worst conceivable flood'. From the TMO programme it was also concluded that flood emergency planning needed improvement.

The key question that needs to be addressed is if and how it can be established if emergency plans for floods are fit for purpose. A first step is to evaluate the so-called robustness or completeness of a plan. However, a plan that is "complete" could still be "ineffective" owing to the accessibility of the plan or level of detail of the different components.

The aim of WP1 of the FIM FRAME project is to assess the "effectiveness" of flood emergency plans developed in England and Wales[1], France and the Netherlands. The following research questions were addressed:

- What are the current flood emergency planning practices in England and Wales, France and the Netherlands? What differences and similarities can be identified?
- Can flood emergency plans be evaluated and if so, how can this be done?
- Which elements within the current emergency plans should be addressed and to what level of detail?
- What makes an emergency plan effective?

The following activities were carried out within the framework of WP1:

- Details of and a comparison of flood emergency planning practices in England and Wales, France and the Netherlands;
- Development of metrics to assess the completeness and the level of detail of a flood emergency plan;
- Review of flood emergency plans in England and Wales, France and the Netherlands to gain an insight into their current status, to identify where the emphases within the plans lie and to enable a comparison between the countries. In addition the review acted as a way to assess the usefulness of the metrics for assessing flood emergency plans.
- An internet survey of stakeholders responsible or involved in producing emergency plans for floods to assess their requirements for flood emergency plans, as well as their views on criteria for a plan to be effective;
- Interviews with stakeholders in England and Wales and the Netherlands.

1.3 Structure of the report

The structure of this report is as follows:

- Chapter 1 provides a background to the objectives of the research and this report;
- Chapter 2 gives brief details of the background for emergency planning for floods in England and Wales, France and the Netherlands;
- Chapter 3 outlines of the metrics that were developed to evaluate flood emergency plans in the three countries covered by the research;
- Chapter 4 reviews emergency plans in the three countries carried out using the metrics that have been developed;
- Chapter 5 gives survey results and stakeholder engagement with respect to required elements and information within a plan;
- Chapter 6 provides survey results and stakeholder engagement with respect to criteria on effectiveness of a plan;
- Chapter 7 gives the conclusions of the report;

[1] The remit of the Environment Agency remit only covers England and Wales, so this research does not cover Scotland or Northern Ireland.

- Chapter 8 provides references used to compile the report;
- Appendices provide full details of the stakeholder engagement and full reviews of the emergency management plans that were undertaken.

2 Background to emergency planning for floods in England and Wales, France and the Netherlands

2.1 Introduction

An emergency plan may be defined as a "*coordinated set of protocols for managing an adverse event, whether expected or untoward in the future*" (Alexander, 2005). This chapter provides a brief description of the emergency planning for floods in England and Wales, France and the Netherlands.

2.2 Background to emergency planning for floods in England and Wales

2.2.1 Introduction

Emergency planning in the UK is governed by the Civil Contingencies Act 2004. The Act divides emergency responders into two categories, known as Category 1 and Category 2 Responders depending on the extent of their involvement in civil protection work, and places a proportionate set of duties on each category.

Category 1 responders are those organisations at the core of emergency response (e.g. emergency services, local authorities). Category 1 responders are subject to the full set of civil protection duties. Category 2 organisations (e.g. Health and Safety Executive, transport and utility companies) are "co-operating bodies" that while less likely to be involved in the heart of planning work, will be heavily involved in incidents that affect their sector.

There is a hierarchy of emergency planning in the UK. This is shown in Figure 2.1. Issues such as evacuation, communication and the setting up of rest areas/shelters are generally covered by generic plans. These plans are then referenced by Multi-Agency Flood Plans (MAFP) which include specific information on flooding. The way in which MAFPs fit in with the rest of emergency plans is shown in Figure 2.2.

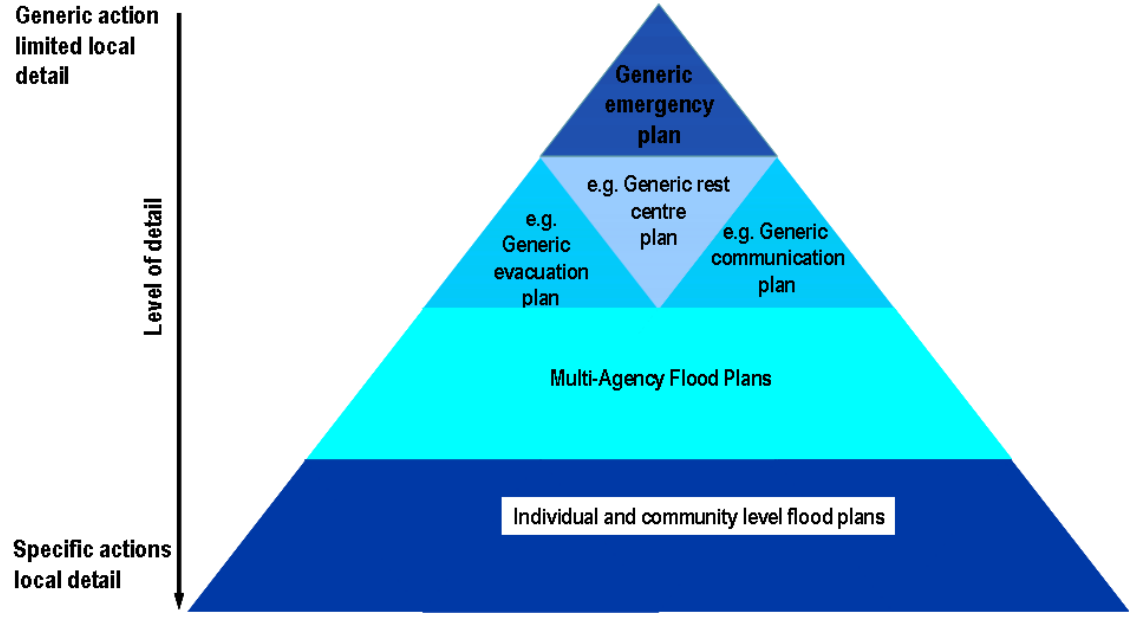
2.2.2 Background to Multi-Agency Flood Plans

In England and Wales, Multi Agency Flood Plans (MAFPs) are produced by the Local Resilience Forum. There are some 43 Local Resilience Forums covering England and Wales that are based on Police areas. Each Local Resilience Forum should consider the flood risk across the whole area for which it is responsible. However, for some areas the response arrangements that are set out in generic emergency places will be sufficient to cover the particular area at risk. For areas where the risk is higher more detailed Multi Agency Flood Plans are required. A specific flood plan is required if:

- The risk falls into the "high" or "very high" category;

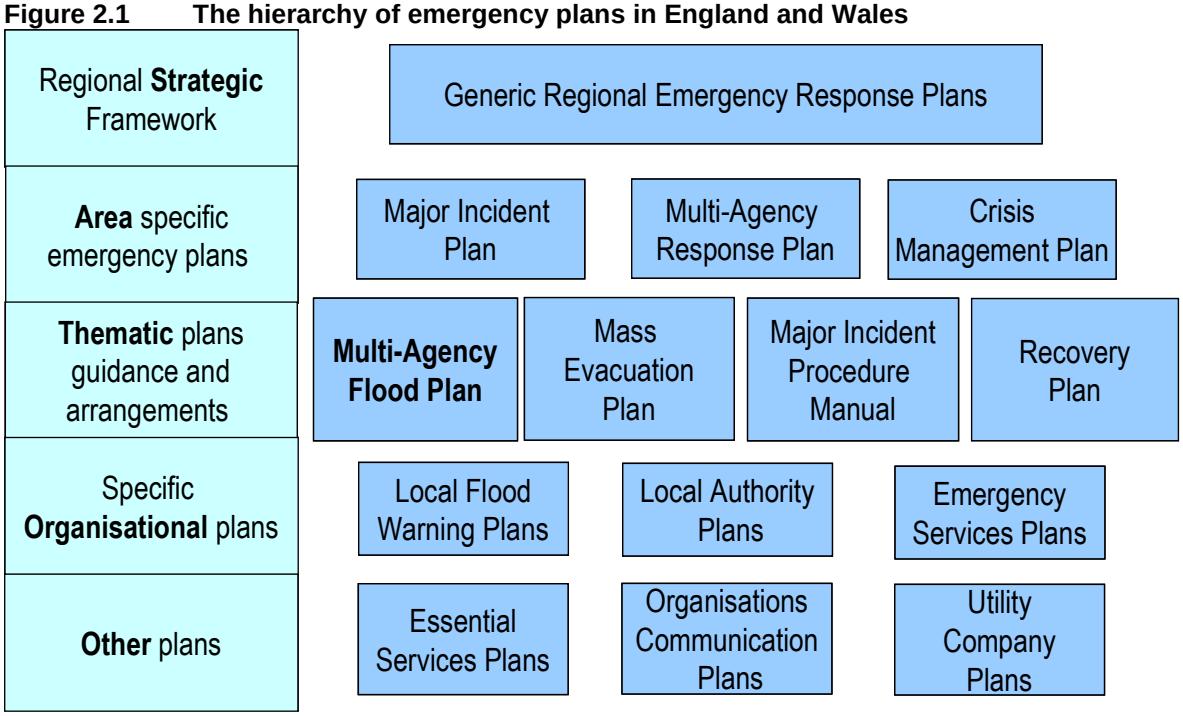
- The number of residential and business properties that are at "significant" or "moderate risk" is classified as substantial or the number of people is excessive;
- The number of vulnerable assets or key infrastructure sites that are at a "significant" or "moderate" level of risk is such that the consequences of flooding would lead to "significant disruptive challenges" that would take days or weeks to put right.

It is also important to note that for reservoirs of a certain size it is also important to produce "off-site" emergency plans, to cover the possibility of dam failures.



(Source: Environment Agency/Defra, 2008)

Figure 2.1 The hierarchy of emergency plans in England and Wales



(Source: Environment Agency/Defra, 2008)

Figure 2.2 How emergency plans "fit together" in England and Wales

2.2.3 *Types of floods planned for in England and Wales at a Multi Agency Flood Plan level ntroduction*

At a Multi-Agency Flood Plan level the types of floods that are generally planned for, where applicable, include: river, sea, tidal, reservoirs, groundwater, surface water and if appropriate failure/overtopping of flood defences. Multi-Agency Flood Plans (MAFP) are not expected to include planning for the flood hazard that could result from foul sewer networks, burst water main, private lakes and canals, unless there is a specific and significant flood risk. In terms of the flood mapping that is shown in the MAFP the guidance states that this is normally limited to maps that show the flood outline for sea and river flooding, where appropriate.

2.3 Background to emergency planning for floods in France

2.3.1 *Introduction*

France is made up of 100 Départements. These are administrative divisions, roughly analogous to the districts of England. The départemental seat of government is called the Préfecture or chef-lieu de département and is generally a city of some importance roughly at the geographical centre of the Départément. The 100 French Départements are grouped into 22 metropolitan and four overseas regions, all of which have identical legal status as integral parts of France. The Départements are further divided into communes, governed by municipal councils. There are approximately 36,700 Communes in France. The Commune is the lowest level of administrative division in France. There is no exact equivalent in the UK. The Communes have a status somewhere in between that of English Districts and Civil Parishes.

It is important to note that the mayor of the Commune plays a central role in France and that he is legally accountable for the security of the citizens and the organisation of rescue operations on the territory of his commune. When an incident extends over more than one commune or its consequences are too important to be managed by local rescue means, the first Départémental State officer (Préfet) takes charge of the emergency operations and a Départemental operational centre is activated. The hierarchy of emergency management in France is shown in Figure 2.3.

Type of event			Command structure	
Example	Characteristics	Actors	Direction of operations	Role of the COD*
• Car accident • Small fire	• Local and immediate consequences • Short duration	Rescue services (standard action)	 Mayor	Watch
• Large car accident • Extended fire	• Local and immediate consequences • Duration of a few hours	Emergency services (rescue with consolidated means)	 Mayor	Follow-up
• Car accident with numerous victims • Accident in the transport of dangerous matters • Problematic fires (industrial sites with a PPI**, tunnels…)	• Local and immediate consequences • Duration of a few hours	Emergency services + Other actors	 Prefet	Support
• Industrial accident • Pollution • Large inundation • Storm	• Extended to several Communes • Duration of a few days • Post-event consequences	Emergency services + Other actors	 Prefet	Direction
• Extended storm (1999) • Epidemic • Extreme flood • Nuclear accident	• Extended to a large part of a département or to several départements • Duration of a few days to few weeks • Post-event consequences	General mobilization	 Prefet	Strengthened direction

Note: * COD: Departmental operational centre with representatives of the various departmental State administrations (rescue services, police, technical services…).
** PPI: Plan Particulier d'Intervention (Specific Emergency Plan)
(Source: Ministère de l'Intérieur, Guide ORSEC départemental, méthode générale, 2006)

Figure 2.3 The hierarchy of emergency management in France

Until recently, emergency plans were only established by the state authorities in France. However, since 2004[2] there has been a move to develop emergency plans at the level of the Communes. It should be noted that in France there are no bespoke emergency plans for floods, other than for reservoir failures.

Emergency planning at national level in France has organised since 1952 around the Organisation de la Réponse de la SEcurité Civile (ORSEC) plan (the organisation of the response and civil security). The ORSEC plan is the main tool for state authorities to manage major and large scale emergencies. The ORSEC plan was updated by a French Act of parliament on 13 August 2004.

[2] 2004-811 law signed the 13 August 2004 on the modernisation of civil security

2.3.2 *Regional and Départemental emergency plans*

There are three types of ORSEC plans:

- Zonal level ORSEC plans;
- Départemental level ORSEC plans;
- Maritime ORSEC plans.

There are nine Zones in France that include a number of Départements. The purpose of the Zone level ORSEC plans is to coordinate emergencies triggered by high magnitude events that either cover more than one Département or which cannot be managed properly with the rescue means available at the level of one Département. The Département level plans cover the whole Département. There are 94 Départements on mainland France.

The Zones and Départements that cover France are shown in Figure 2.4. The Département level ORSEC plans comprise:

- An inventory and an analysis of the risks and the potential effects of natural and other hazards on people, businesses and the environment;
- Operational plans to respond to an emergency;
- Methods for the preparation and training of emergency responders in both the public and private sector;
- Management of various networks including gas, water, electricity and transport;
- Evacuation of the population.

Falling under the ORSEC plans there are what are known as Plan Particulier d'Intervention (PPI). These are specific plans related to specific assets (e.g. a nuclear station or dam) that could pose a risk to the surrounding population. These are discussed below.

It is important to note that there are also ORSEC plans for maritime regions. These cover specifically: pollution incidents; nuclear accidents at sea; aircraft accidents at sea; and shipwrecks. At a national level there is the Centre Opérationnel de Gestion Interministérielle des Crises (COGIC) which is a national operation centre for the management of emergencies. This gathers information at a national level and manages national emergencies.

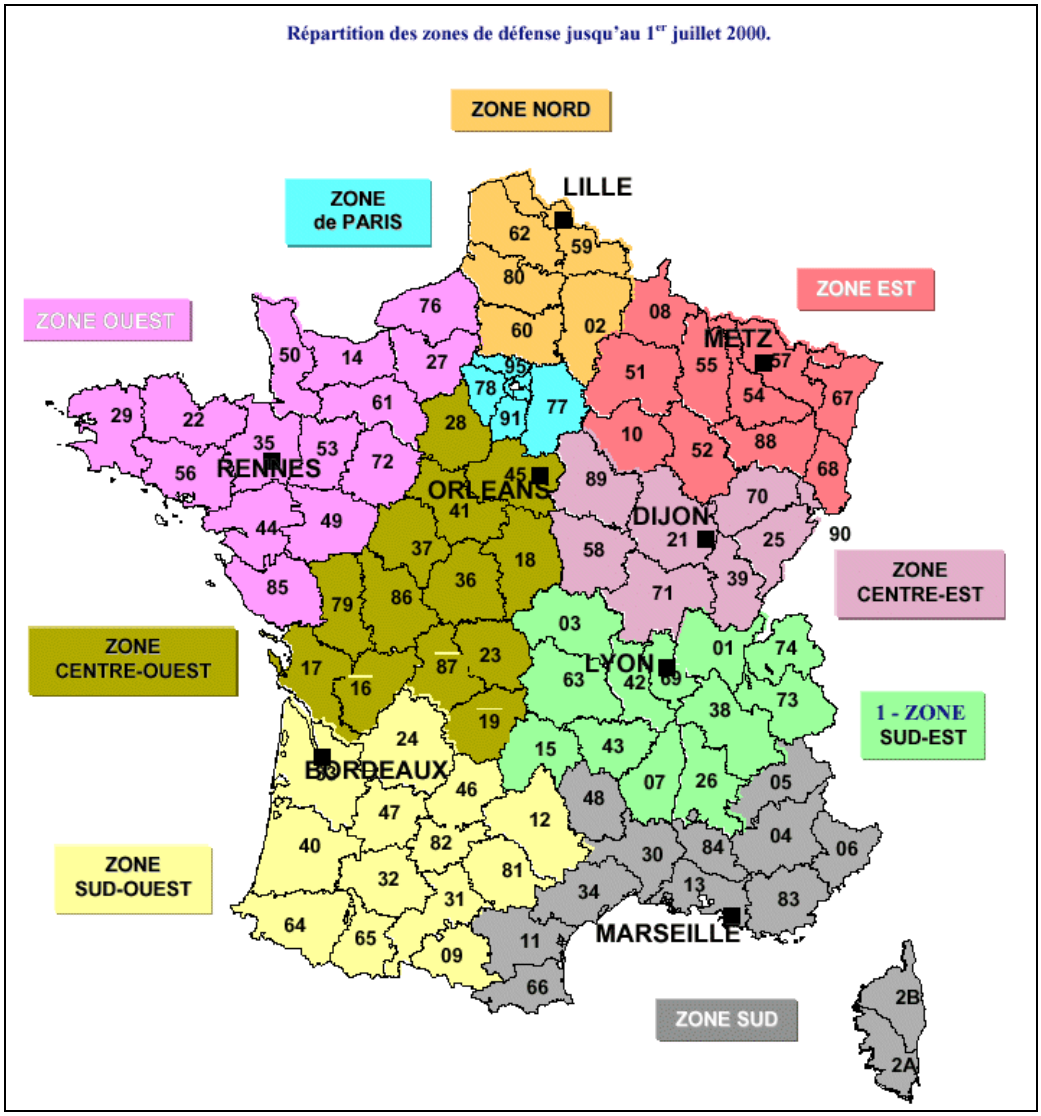


Figure 2.4 **Map of the Zones and Départements in France for which ORSEC plans are produced**

2.3.3 *Plans Communaux de Sauvegarde (PCS) - Municipal emergency plans*

At a communal level in France there is the Plan Communal de Sauvegarde (PCS) (local emergency management plans). The PCSs were created to help municipalities take charge of the management of emergency planning at a local level. It is important to note that there are some 36,700 communes in France. Not all communes have to produce PCSs. PCSs are compulsory for communes where an approved Risk Prevention Plan exists or located in the area of a Plan Particulier d'Intervention, discussed below. It has been a major challenge at local level to get these implemented and to date there has been little feedback as to how many of these Communes have implemented the PCS plans.

The number of PCS that have been completed in France is difficult to ascertain. The law requires the local communities to submit a Plans de Prévention des Risques Naturels (PPR) detailing the risks posed by natural hazards before a PCS can be produced. A PCS must be produced at least two years after the

PPR is approved. It is estimated that approximately 5,000 communes in France should already have started or completed their PCSs and that approximately 10,000 PCSs will be required in total.

The PCSs aim at assisting the local level authorities in preparing the management of an emergency. PCSs cover all types of emergencies not just floods. The connection between both the PCSs and ORSEC plans is not always clear. Different actors do not necessarily agree on the thresholds that trigger particular actions. The communes in the Gard Département in the south of France have progressed their production of PCSs faster than many other Départements. However, even here the distribution of the plans is "patchy" as Figure 2.5 shows.

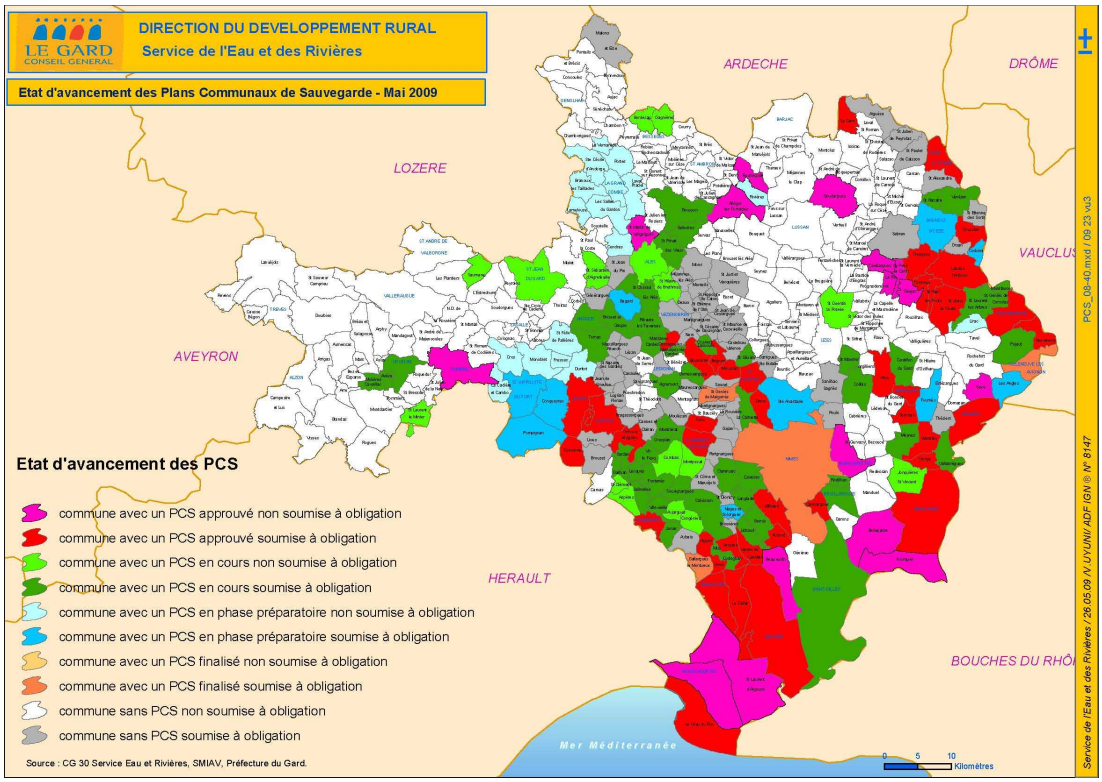


Figure 2.5 The communes that have prepared a PCS in the Gard Département of France

2.3.4 Relationship between different plans

The PCS is the first plan that is put into action when an emergency occurs. The PCS is activated by the mayor of each Commune and his employees. When the emergency becomes too difficult or large to handle for local authorities, the ORSEC plan complements the PCS, setting out rescue and evacuation strategies. The ORSEC plans have been in place in one form or another for 50 or so years. The legislation for the preparation and implementation of PCSs has only been in place since 2005. There appears to be little accountability regarding the PCS plans at a national level. There are only a limited number of Départements, such as the Gard, that have determined how many PCS plans have been completed.

2.3.5 Plan Particulier D'Intervention (PPI) - Emergency plans for specific installations

In France there are also emergency plans called Plan Particulier D'Intervention (PPI). These are plans for particularly sensitive installations such as nuclear power plants and chemical facilities. The requirement for a PPI is decided by the Départemental State officer (Préfet). The Communes have to include the requirements of the PPI in their Plan Communal de Sauvegarde (PCS). The requirements of the PPIs are also integrated in the ORSEC plans.

In terms of flooding PPIs are required for a dam when it has a storage capacity of over 15 millions m^3 or is over 20 m high. Before a PPI for a dam is prepared the owner of a dam needs to establish:

- The consequences of a dam break;
- Methods for monitoring the dam;
- A warning system for the downstream population, and other receptors;
- There is also a requirement to put in place an inventory of facilities such as chemical plants that if flooded could result in another hazard.

Électricité de France (EDF) operates some 200 dams in France and has PPIs in place for around 70 of them.

2.3.6 Types of floods planned for in France

In France, emergency plans such as the PCS and ORSEC plans are supposed to address all kinds of floods including: slow-rising fluvial floods, coastal surges, flash floods and the failure of flood defences. ORSEC plans are drawn up at a Département level; hence they are only used in the case of floods that cover a wide spatial area. One of the reasons for the introduction of PCS plans is that the more generalised flood incident management plans actually did not address local flooding. As a consequence PCS plans often focus on the management of urban flooding as well as flash floods and fluvial flooding. Although coastal floods do occur they are generally not addressed in emergency plans. This is because coastal flooding is not one of the major sources of flooding in France. There are ORSEC maritime plans; however, these focus on incidents at sea (e.g. ship wrecks and aircraft crashes) and pollution incidents.

2.4 Background to emergency planning for floods in the Netherlands

2.4.1 Local emergency plans

In the Netherlands safety is legally defined as a local responsibility. The main responsibility of preparing for flooding lies with the municipalities. This is regulated by the 2004 Act "Improvements in the emergency management" (Wet Kwaliteitsbevordering Rampenbestrijding, (WKR)). Local authorities (municipalities) are obliged to formulate emergency management plans for the potential risks within their area. Three types of plans are required; a general emergency management plan which focuses mainly on the organisation, responsibilities, duties and authorities of the different institutes and officials and, depending on the nature of the risk, a disaster plan or a coordination plan. A disaster plan covers "static risks" which is defined as a risk for which location, nature and outcome can be foreseen. The act sets out a list of aspects to be covered by a disaster plan. Coordination plans should be drawn up for incidents on waterways, roads, rail, nature reserves and cross border regions. The act does not specify aspects to be covered by a coordination plan. Flood risk is covered by both coordination plans and disaster plans as it is not clear by which type of plan a flood event should be covered by. Often flood risks are addressed on a

regional scale via the cooperation of several municipalities and agencies involved in event management or within the context of a Safety Region, whichsis discussed below. This is due to the fact that the extent of a flood almost always exceeds the municipality boundaries.

2.4.2 The Safety Regions

A Safety Region is a regional cooperation of municipalities, police, fire brigades and health care organisations. In 2006/2007 a Government bill entitled the “Safety Region Bill” was submitted for the establishment of the “Safety Regions”. As of January 2010 the act was still under discussion. If the Bill is approved, 25 Safety Regions should be operational by the end of 2010. In many areas Safety Regions have already started emergency planning in advance of the approval of the Safety Region Act. The draft act states that the Safety Regions prepare for risks by first performing a risk inventory. In addition three plans need to be drawn up:

- A policy plan which formulates the organization of the regions’ event management;
- A crisis plan which is a generic plan (applicable to all types of risks) on operations for disasters and crises;
- A disaster plan which is only obligatory for airports and institutes with a high risk of causing a disaster.

This implies that the act does not dictate that disaster plans are drawn up for regional risks such as flooding. However, in the context of the TMO, Safety Regions (or if not yet initiated a cooperation of neighbouring municipalities and agencies), have drawn up flood disaster plans. These plans have not been produced using a fixed format or according to guidelines. It should be noted that not all Safety Regions will need to deal with flood risks or only to a limited extent.

2.4.3 The Water Boards

Preparing for flood events on a local and regional scale has traditionally been the responsibility of the Water Boards. The Water Boards focus mainly on their field of responsibility which is the monitoring of water levels, prevention of failure of defences, implementation of measures to prevent or limit flooding and provision of information. This was legally defined in paragraph 17 of the Water Administration Act of 1900 which dealt with the ‘provisions for preparation and acting in case of danger’. The Water Boards have been obliged to draw up emergency plans. Such a plan includes an inventory of the kind of emergencies that may happen and their potential risks, the measures to be taken, the required equipment and the services to be provided by different institutions. The plans also include:

- The organization of the water manager emergency response team;
- The warning and reporting procedures;
- The quality assurance of the plan.

A new act, the Water Act (Waterwet), was passed in December 2009. The Water Act aims at preventing and, where applicable, limiting floods and drought. It replaces the Water Administration Act. The new Water act also states the formulation of a calamity plan by the water managers. The act does not define specifically the aspects to be addressed, but does put an emphasis on being consistent with the municipality and Safety Region emergency plans.

2.4.4 National emergency plan

The threat of a coastal or a large fluvial flood will often be dealt with on a national level. This process is described in the National Response Plan. This plan focuses mainly on the organization, responsibilities, duties and authorities of the different institutes and officials, operations and communication.

2.4.5 Relationship between different plans

A flood threat starts when a warning water level has been exceeded. The first stage is activated at which responsibility and coordination is on a regional level. Four stages are defined which are linked to warning water levels. The responsibility shifts from a regional to a national level from the third stage onwards, although the regional parties are still responsible for assistance on operational aspects. The National Response Plan describes the organization and responsibilities of all four stages. An overview of event planning in the Netherlands is shown in Figure 2.6.

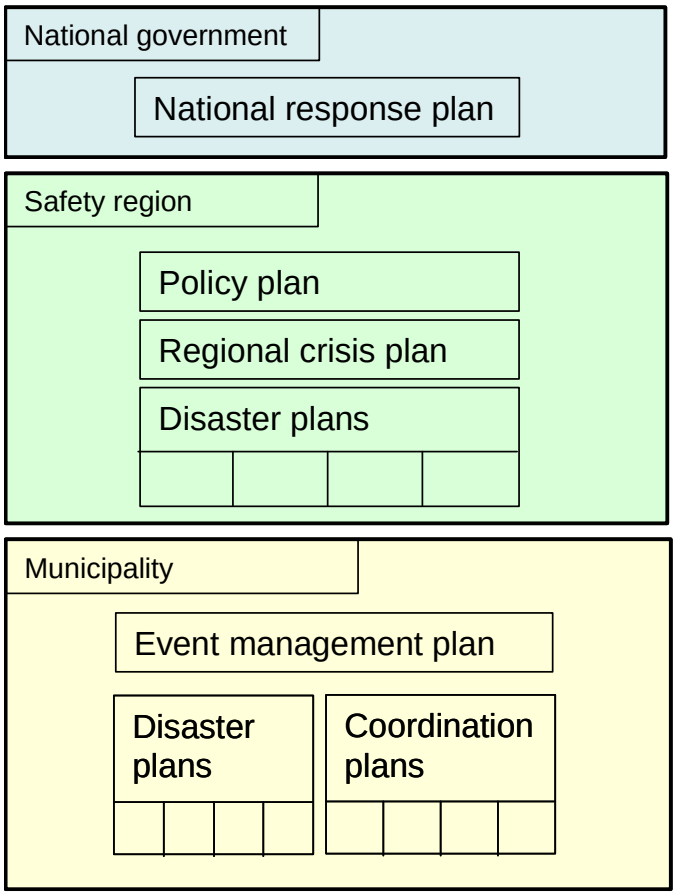


Figure 2.6 Overview of emergency planning in the Netherlands

2.4.6 *Type of floods planned for in the Netherlands*

The Netherlands is a delta area bordered by the sea on the west and crossed by the River Meuse and the River Rhine. A large part of the Netherlands, approximately 25%, lies below sea level and an even larger area, approximately 55% is susceptible to flooding from river and sea. In addition, floods can occur from regional waters such as free flowing streams, brooks, canals and urban drainage systems. Regional flooding is mostly considered to be of a low impact compared to other floods and it is therefore expected that less attention is given to the preparation for these types of floods. It is only recently that as a result of the Floods Directive, Water Boards have started to systematically map the flood risks for regional floods. Owing to the terrain of the Netherlands, flash floods are highly unlikely and there are also no large dams.

The areas susceptible to flooding are protected by flood defences. These defences form rings protecting the land within the ring against flooding from the rivers and sea. The safety standards for the dike rings are very high ranging from 1 in 250 to 1 in 10,000 years. The safety standard is related to the economic activity, assets and the number of inhabitants threatened by floods within the dike ring. If a flood were to occur, the impact of flooding could be very high due to the fact that the majority of inhabitants and the main economic centres lie within flood susceptible areas. The potential flood extent, dike rings and Safety Regions are shown in Figure 2.7.

Dike rings differ from each other and this suggests that emergency planning for floods will also differ. One of these differences is the forecast lead time. A coastal flood has a forecast lead time of 24 to 48 hours, whereas the forecast lead time for a fluvial event is in the order of five days. From flood model simulations it can be seen that water depths resulting from a fluvial flood are also larger than for coastal floods. The dike rings along the main rivers are deep and relatively small compared to the dike rings along the coast. Water depths of up to 6 m can be reached.

2.5 Differences and similarities in emergency planning for floods in England and Wales, France and the Netherlands

In all three countries there has been legislation passed in the past five or six years that has acted as a catalyst for the production of emergency plans. In England and Wales and the Netherlands Acts of Parliament passed in 2004 have provided an impetus to the formulation of emergency plans and in France an Act passed in 2005 paved the way for the production of local level emergency plans.

In all three countries the “basic” or “reference level” for emergency planning is the responsibility of local government. Although regional and national flood emergencies cannot be managed exclusively at a local authority level, “*the essential remedy to an emergency situation is almost inevitably applied at a local scale*” (Drabek and Hoetmer, 1991). In the Netherlands, planning is often dealt with on a regional level due to the expected extent of flooding. In all three countries there is a hierarchy of emergency planning with national, regional and local plans. There is a “shift” in responsibility from local to regional to national level as the spatial extent of a flood event increases. There often appears to be a “disconnect” or “overlap” between the local, regional and national emergency plans in all three countries in terms of emergency planning. For example in France, it is estimated that some 10,000 local emergency plans will be produced. However, it is not always clear how well these connect with regional level plans. In England and Wales Multi-Agency Flood Plans do not always mention the link to other emergency response plans that include complementary information.

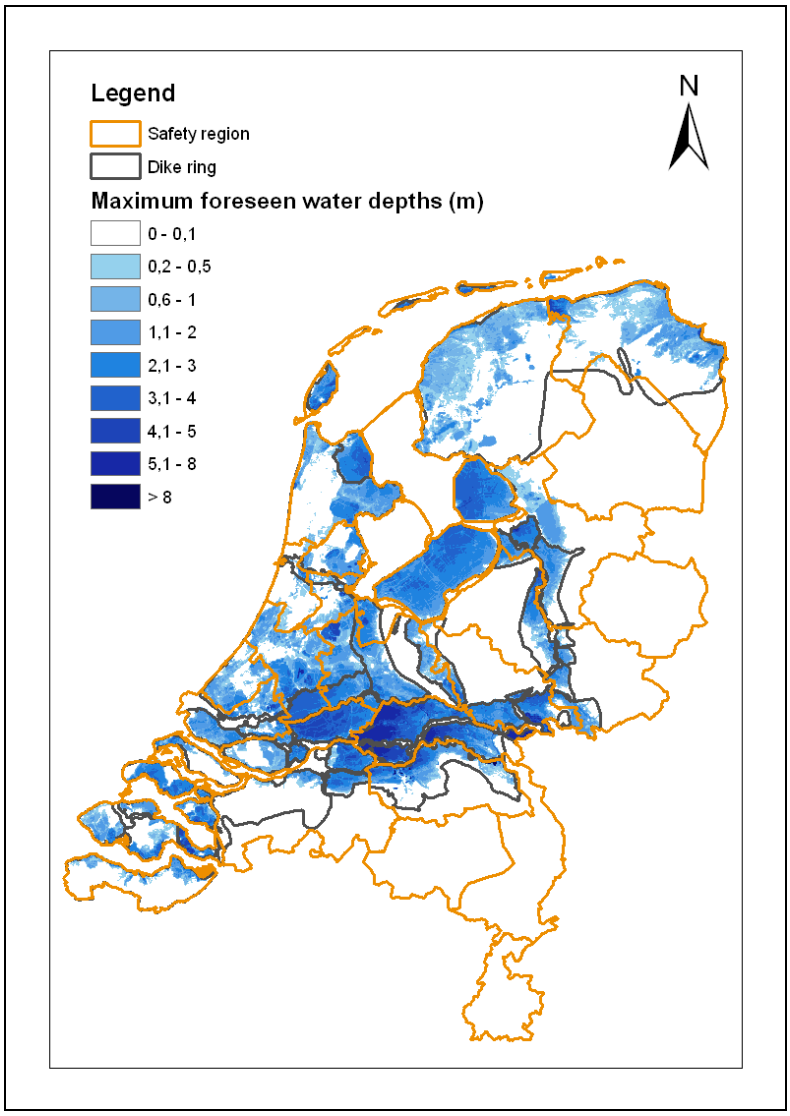


Figure 2.7 Water depths, safety regions and dike rings in the Netherlands

The production of emergency planning for floods in all three countries at a local level is a relatively new phenomenon. The local authorities who some times have limited capacity in emergency planning and emergency responders (e.g. fire brigade, police and ambulance service) who often do not have the expertise in flooding, are now faced with having to prepare for floods. This requires cooperation between the local services and authorities and experts on flooding. In England and Wales and in the Netherlands cooperation is organised through the organised collaboration of the different agencies involved (the Local Resilience Forums and the Safety regions).

For all three countries a generic plan focuses on strategic planning covering issues such as organisation and responsibility, communication and evacuation. These plans cover other risks besides flooding. In England and Wales and the Netherlands underlying plan(s) focus on flooding. In France, unlike in England and Wales and the Netherlands, there are no emergency plans that focus specifically on flooding. The plans in France focus on a range of different hazards, including technological hazards, although in many areas flooding is the most important hazard.

In both France and England and Wales there are guidelines in place to assist emergency planners at a local level produce these plans. In France these guidelines have been in place since 2005 and in England and Wales since 2008. It is important to note that there is no fixed format for plans in France and England and Wales and this leads to a variation in length and quality of the plans which is discussed in Chapter 4. For the Netherlands no guideline exists for the production of emergency management plans.

With the possibility of some 10,000 local emergency plans being produced, France out of the three countries in the project has the most localised level of emergency planning. It is also the country where there appears to be the greatest “disconnect” between the local level plans and the regional and national level plans.

3 Development of metrics to assess flood emergency plans

3.1 Introduction

Recent decades have seen significant increases in the number, scope and complexity of incidents and disasters. It is now generally agreed that places that are significantly at risk of hazards should be required to construct emergency plans (Alexander, 2005). Research carried out by Alexander (see Alexander, 2002, 2003, 2005) has found that there is an "*enormous variety and lack of homogeneity*" amongst emergency planning documents in many parts of the world. Alexander postulates that this implies that there is "*a shortage of adequate standards* [or metrics] *for creating, evaluating and approving emergency plans*" and that "*virtually no appropriate standards seem to exist*" (Alexander, 2005). Alexander also found that there was little in the way of metrics via which the "*fitness for purpose*" of emergency management plans can be developed.

This chapter briefly details the developments of metrics with which various elements of the plans in the three countries could be assessed. These metrics have been applied to evaluate emergency plans in the three countries to give an insight into the differences and similarities between the countries and the level of detail and emphases within the plans. The evaluation of the emergency plans also acted as a test for the applicability of the developed metrics. In addition the survey questions have been drawn up on the basis of the developed set of metrics.

3.2 Requirements of metrics

A metric may be defined as "*A measure for something; a means of deriving a quantitative measurement or approximation for otherwise qualitative phenomena*". Many emergency managers have expressed a need for metrics and guidance as they are often uncertain about the quality and appropriateness of their plans (Alexander, 2005). Many of the consulted stakeholders, who are responsible for formulating emergency management plans for floods, indicated that guidance concerning how their plans should be formulated and how they can measure if they are "fit for purpose" would be useful. Evaluation of flood emergency plans can assist in identifying strengths and weaknesses in different approaches, as well as aid in documenting improvements (or deteriorations) made over time.

The set of metrics developed had to be:

- Applicable to all the countries taking part in the research;
- Be able to be applied to emergency plans for floods at a range of geographical scales ranging from a regional to local level;
- Generic but at the same time be clear and focused to avoid misinterpretation;
- Measurable;
- Realistic given the various constraints related to emergency planning.

3.3 Description of the developed metrics

The metrics that were developed are given in Table 3.1. These metrics were developed following a review of a wide variety of emergency plans and limited guidance that currently exist, as well as consultation with a range of stakeholders in the three countries.

The metrics allow for the plans to be "scored" in a quantitative manner. For example a score of "1" would be given for a metric where the level of detail is low"; "2" where the level of detail is medium and "3" where the metric is treated in a high level of detail. By averaging the metric scores, an overall score of a plan can be obtained. In addition the average score *per metric* for the evaluated plans gives an insight into which metrics are addressed within the plans and to what level of detail. The average scoring range for the developed metrics was divided into five equally distributed bands between a score of 1 and 3. These scoring bands are given in Table 3.2. The descriptions of the scores are based on the judgement of the project team. It is important to note that whether an emergency plan is "acceptable" will be based on an individual assessment.

Table 3.1 Generic metrics for the assessment of flood emergency plans in England and Wales, France and the Netherlands – Part 1

Metric	Level of detail		
	Low	Medium	High
Objectives, assumptions and target audience			
Aims and objectives of plan	Not detailed	Aims and objectives included but could be clarified further	Clearly stated aims and objectives including the area covered, types and sources of flooding
Target audience and updating of the plan	Not detailed	Audience defined and plan dated	Audience defined and how they will be notified of updates and modifications to the plan included
Assumptions made by the plan	Not detailed	Covers some aspects	Covers all aspects including: flood warning lead time; method by which rescue will be undertaken; implications of the failure of critical infrastructure
Organisation and responsibilities			
Actions, roles and responsibilities	Not detailed	Brief details of the roles and responsibilities related to the activation of the plan provided	Details of the roles and responsibilities related to the activation of the plan provided including health and safety and environmental considerations
Recovery	Not detailed	Brief details of how the recovery is managed	Details of how the recovery is managed including clean up, waste disposal, repairs to public assets, humanitarian assistance
Training and exercises	Not detailed	Brief details of training and exercise requirements	Internal and external (with other organisations) training and exercises outlined
Plan activation	Not detailed	Brief description of the thresholds or levels used to activate plan	Description of the thresholds or levels used to activate plan together with flow chart
Communication			
Communication with other agencies	Not detailed	Outlined in words	Detailed and the links shown diagrammatically
Communication with the public	Not detailed	Outlined in words	Detailed and shown the links shown diagrammatically
Management of the media	Not detailed	Outline media management strategy in place	Well defined media management strategy in place
Flood warning (if available)	Undefined	Levels of flood warning with details of the areas flooded at each level	Levels of flood warning with details of the areas flooded at each level and shown on a map
Relationship with complementary emergency plans detailed	Not detailed	Outlined in words	Detailed and the links shown diagrammatically

Table 3.1 Generic metrics for the assessment of flood emergency plans in England and Wales, France and the Netherlands – Part 2

Metric	Level of detail		
	Low	Medium	High
Evacuation			
Evacuation routes	Not detailed	Evacuation routes shown on a map	Evacuation routes detailed together with roads likely to be closed and their accessibility for emergency vehicles and other vehicles
Shelters/Safe havens	Not detailed	Safe havens/shelters shown on a map	Safe havens/shelters shown on a map with their capacity and facilities
Flood hazard			
Flood hazard map	Not detailed	Flood hazard map(s) showing extent	Flood hazard map(s) showing water depth and velocity
Details of previous floods (if available)	Not detailed	Brief description of historical flood	Description of historical floods with the cause and a brief description of the risk in terms of people and properties affected
Flood risk to receptors			
Flood risk to people	Not detailed	Number of people potentially affected included	Potential injuries and loss of life included and mapped for a range of scenarios
Flood risk to vulnerable people (e.g. elderly or disabled)	Not detailed	Areas where elderly/sick people live mapped	Numbers of vulnerable people defined with a response strategy
Flood risk to residential property	Not detailed	Number of properties defined	Number of properties defined together with those at risk of collapsing during an extreme flood
Flood risk to businesses	Not detailed	Number of businesses defined	Number and type of businesses defined together with potential losses
Flood risk to critical infrastructure (e.g. water supply, gas, electricity, police, fire brigade)	Not detailed	Number of pieces of critical infrastructure shown on the flood map(s)	Number of pieces critical infrastructure shown on the flood map(s) and an assessment of their likelihood of failure during a flood
Potential for NaTech hazards at industrial facilities (if present)*	Not detailed	Potential NaTech sites shown on map	Potential NaTech sites shown on site and brief details of the response

*Note: A NaTech is defined as technological hazard that is triggered by a natural hazard. For example the flooding of an industrial plant may lead to the release of a toxic chemical that poses a threat to humans, as well as flora and fauna

Table 3.2 Scores for the emergency plan

Average score	Average quality	Description to determine the quality of the flood emergency management plan
2.6 to 3.0	Good	There is little or no further information that could have been included in the plan(s). This can be considered as a 'Good' score with little room for improvement.
2.2 to <2.6	Above average	There is some further information that could have been included in the plan(s). This could be considered an "Above average" score.
1.8 to <2.2	Average	Considerably more information could have been included in the plan(s). This could be considered an "Average" score.
1.4 to <1.8	Room for improvement	There is information missing from the plan(s). There is "Room for improvement".
1.0 to <1.4	Considerable room for improvement	There is a large amount of additional information that could be included in the plan(s). There is "Considerable room for improvement".

4 Review of emergency flood plans in England and Wales, France and the Netherlands

4.1 Introduction

This chapter provides the results of the review of the flood emergency plans that have been collected by the project team in England and Wales, France and the Netherlands. The plans were reviewed using the metrics that have been developed by the project team and which are detailed in Chapter 3. The average scores for each metric were calculated as well as an average for each emergency plan. The objectives of this exercise were:

- To assess which metrics are being addressed in emergency plans and to what level of detail;
- To assess the differences and similarities of emergency planning across the three countries.

It should be noted that some of the plans may have been updated since the review was performed. However, it was felt that it was a valid exercise to apply the metrics to plans even if they are “out of date” or a draft version because it demonstrates the adequacy of the plan at the time it was written and if a later revision of the plan becomes available then it may allow a comparison to be made at a later date.

The plans were obtained via several routes:

- Direct contact with and requests to relevant stakeholders such as the Environment Agency in England and Wales; mayors in France and Safety Regions in the Netherlands;
- Literature searches;
- Downloaded from the internet.

This chapter provides a summary of the results. It focuses on the score per plan and on the score per metric. For each country an overview of the average score per metric is provided. Colours have been used to indicate to which “metric group” the metric belongs. The colour code is shown in Table 4.1.

Table 4.1 Colour coding for the metric groups

Metric group	Colour code
Objectives, assumptions and target audience	
Organisation and responsibilities	
Communication	
Evacuation	
Flood hazard	
Flood risk to receptors	

Detailed reviews of each of the plans available to the team at the beginning of April 2010 for England and Wales, France and The Netherlands are provided in Appendices A, B and C respectively.

4.2 Review of emergency flood plans in England and Wales

For England and Wales the focus was on Multi Agency Flood Plans (MAFPs) and 13 MAFPs have been reviewed. In England and Wales a guidance and checklist have been produced by the Environment Agency/DEFRA for MAFPs. The guidance provides advice to Local Resilience Forums in England and Wales as to what should be included in MAFPs and how a MAFP should be formulated including the use of diagrams, maps and tables. The latest versions of these are:

- Developing a Multi-Agency Flood Plan (MAFP) – Guidance for Local Resilience Forums and Emergency Planners, February 2008;
- Checklist for Multi-Agency Flood Plans (MAFPs), December 2009.

Table 4.2 provides brief details of the plans that were available to the project by the beginning of April 2010 and that were analysed using the developed metrics. The locations of the plans that were reviewed are shown in Figure 4.1. It is important to note that many Local Resilience Forums are still in the process of producing MAFPs and this together with issues of confidentiality in some cases, limited the number of MAFPs that were readily available for review.

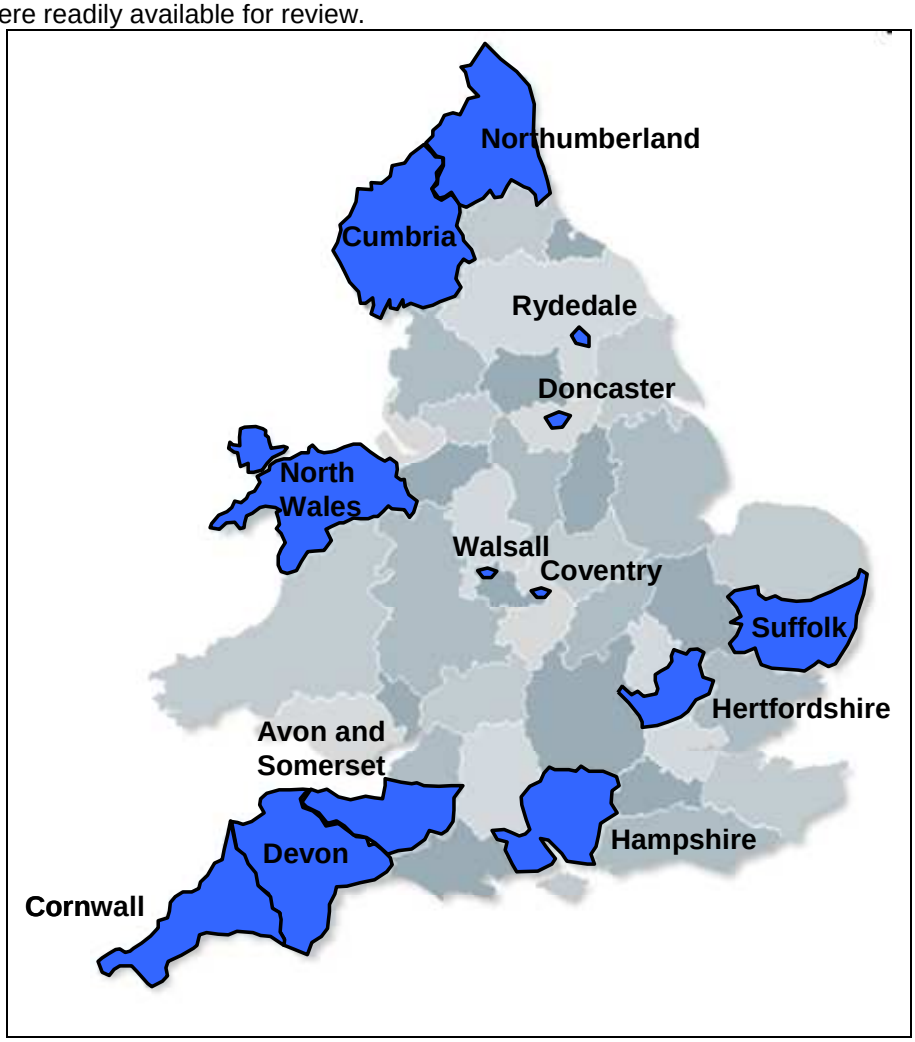


Figure 4.1 Location of the Multi-Agency Flood Plans reviewed in England and Wales

Table 4.2 List of flood emergency plans reviewed for England and Wales

Name of plan	Date of plan	Plan score	Length of plan (pages)
Cornwall Emergency Plan	January 2004	2.00	Approximately 150
Devon Emergency Plan	April 2004	2.18	Approximately 250
Hampshire Flood Response Plan	December 2007 Version 1	1.32	28
Suffolk Multi Agency Flood Plan	March 2009 Issue 2	1.45	43
Walsall Flood Plan	January 2009 Amendment 01/09	1.45	24
Coventry Multi-Agency Flood Plan	Draft 31 March 2009	1.70	46
North Wales Multi-Agency Flood Plan	Version 3 May 2009	2.16	227
Northumberland Local Resilience Forum Multi Agency Flood Plan	Consultation Draft Version 1.0 September 2009	2.32	209
Cumbria Multi-Agency Flood Plan	October 2009	2.25	300
Doncaster Multi-Agency Flood Plan	Version 5 October 2009	2.27	117
Multi-Agency Flood Response Coordination Plan - Ryedale	November 2007 Reviewed: October 2009	1.86	120
Hertfordshire Multi-Agency Strategic Flood Plan	Version 1.6 November 2009	1.34	21
Avon and Somerset	Version 1.9 December 2009	2.02	58

The average score of the MAFPs reviewed was 1.9 which rates as an “average” score using the developed metrics. The plans’ scores ranged from 1.3 classed as “considerable room for improvement” to 2.3 classed as “above average”

Table 4.3 provides the average scores of the metrics for the 13 plans that were reviewed in England and Wales. It is interesting to note that of the 22 metrics that were used to evaluate the plans that no metrics ranked as being “Good”, only five metrics ranked as being “Above average”; and only five other metrics produced an “Average” score.

Table 4.3 Average score of the metrics for the 13 Multi-Agency Flood Plans (MAFPs) that were reviewed in England and Wales

Metric	Average score	Average quality of the metrics
Target audience and updating	2.46	Above average
Aims and objectives of plans	2.38	
Plan activation	2.38	
Flood Warning	2.31	
Actions, roles and responsibilities	2.23	
Details of previous floods	2.15	Average
Relationship with complementary emergency plans	2.15	
Communication with other agencies	2.08	
Recovery	2.08	
Training and exercises	1.85	
Flood hazard map	1.77	Room for improvement
Flood risk to residential properties	1.77	
Management of the media	1.77	
Risk to vulnerable people	1.69	
Shelters/Safe havens	1.69	
Communication with the public	1.65	
Flood risk to critical infrastructure	1.58	
Risk to people	1.54	
Evacuation routes	1.46	
Flood risk to business	1.31	Considerable room for improvement
Assumptions made by the plan	1.35	
Potential for NaTech hazards	1.31	
Key to table - Metric group	**Colour code**	
Objectives, assumptions and target audience		
Organisation and responsibilities		
Communication		
Evacuation		
Flood hazard		
Flood risk to receptors		

It is seen that the metrics groups ‘’Objectives, assumptions and target’, Organisation and responsibilities” and flood hazard” score around average and higher, whereas the metric groups “flood risk to receptors” and “evacuation” score below average.

Overall results from the review of the plans are given below.

(i) Impact of flooding on receptors including critical infrastructure

Although information and methods are available to assess the impact on receptors including people, buildings and critical infrastructure, this often does not seem to find its way into the MAFPs. Recent flood events in the England and Wales have highlighted the need to assess the vulnerability of critical infrastructure such as electrical sub-stations, wastewater and water supply infrastructure and gas pipelines. There are many MAFPs that do not show the location of critical infrastructure in the floodplain and there are none that give the probability of inundation of these pieces of infrastructure, or the probability of failure of these pieces of infrastructure as a result of flooding.

Although many of the MAFPs provide details of the potential number of people located in the floodplain, none of the MAFPs reviewed provided any details of the risk in terms of the potential number of people

injured. There is also little information given on the risks to businesses, although this may be because emergency planners do not see these as their main priority in planning for flood emergencies.

(ii) Evacuation and shelters

There are few plans that indicate evacuation routes. This may be because they are thought by emergency planners to be "obvious", which is not always the case, because they are included in local plans or because they are simply not thought of as being important. However, in many heavily defended areas of England and Wales these routes will be important. Failure of coastal flood defences, as happened in the 1953 floods, could put 100,000 of people at risk and could call for a mass evacuation. There are several coastal areas and heavily defended urban areas, such as London, where it is not clear if the options for and time required to undertake evacuations for flood events have been assessed.

Plans often have details of shelters and rest centres; however, they rarely indicate their facilities or capacity. This may be because these details are held in separate evacuation or shelter plans. However, if they are it is rarely stated in the plans that these exist.

(iii) Hazards arising from NaTechs and mapping of flood hazards

The metric that scored the lowest was the potential for NaTech hazards (i.e. other hazards triggered by flooding such as the release of toxic chemicals as a result of the inundation of a chemical facility). Of the plans reviewed only one showed the location of these potential sources of NaTech hazards in the floodplain.

Flood hazard mapping can be considered to be a "mature" technology. Most, although not all, of the MAFPs reviewed contained flood hazard maps in one form or another. However, although it is available in many areas none of the MAFPs show the flood hazard in terms of depth, velocity or a combination of these two variables. This may be because the guidance document for the preparation of MAFPs indicates that flood maps showing flood extent should suffice. Flood maps showing maximum depths, velocities or a combination of these could be of use to emergency responders in terms of potential issues with access and rescue.

(iv) Communication with the media and assumptions

Few of the plans mentioned the assumptions that had been made by the plan (e.g. extent of the flooding, implication of joint tidal and fluvial floods, rescue methods) and very few mentioned if a communication plan with the media was in place.

4.3 Review of emergency plans in France

For France the focus was on the Plan Communal de Sauvegarde (PCS) level. Fourteen PCSs were analysed using the developed metrics. For comparison, two additional plans have been assessed. These are the "Dispositif Orsec Zone de Défense de Paris" (DOZDParis) and the Plan de Decours Specialise Inondations Loire (PSSIL) which is a specific emergency plan for floods in the Loire River catchment. These have been compared with a PCS at local scale within the relevant area. An overview of the reviewed plans is given in Table 4.4.

Table 4.4 Overview of reviewed emergency plans in France

Name of plan	Type of plan	Date of reviewed version	Score of plan	Length of plan (pages)
Blagnac PCS	Plan Communal de Sauvegarde	2002 updated 2009	1.76	58
Quissac PCS	Plan Communal de sauvegarde	2006	2.19	25 plus appendices
Perpignan PCS	Plan Communal de Sauvegarde	June 2006	1.95	192 plus maps
Metz PCS	Plan Communal de Sauvegarde	September 2007	2.05	69
Brives-Charensac PCS	Plan communal de Sauvegarde	September 2007	1.95	6
Plan de Secours Spécialisé Inondation Loire	Emergency plan for the upstream part of the Loire River catchment	2004 updated 2009	1.90	23
Nanterre PCS (local emergency plan)	Plan communal de sauvegarde	2007	2.10	104 plus appendices
Le Cailar PCS	Plan Communal de Sauvegarde	October 2007	2.34	26 plus appendix
Nice PCS	Plan Communal de sauvegarde	31 October 2007	1.90	24 appendices
Cléry Saint-André PCS	Plan Communal de Sauvegarde	2009	2.41	613
Nancy PCS	Plan Communal de Sauvegarde	2009	1.33	49
Saint Raphael PCS	Plan Communal de Sauvegarde	2009	1.52	142
Piolenc PCS	Plan Communal de Sauvegarde	April 2009	1.43	122
Sommières PCS	Plan Communal de Sauvegarde	17 April 2009	2.10	87
Dispositif Orsec Zone de Défense de Paris	Regional Emergency plan region Ile-de-France	October 2009 Draft version	2.14	23 plus appendices
Tarascon PCS	Plan Communal de Sauvegarde	2006 updated in November 2009	1.84	92 plus appendices

The French Ministry of Interior and the Institute of Major Risks (Institut des Risques Majeurs (IRMa)) in Grenoble have both developed separate guidelines and checklists to assist emergency planners in formulating PCSs. As a consequence PCS plans tend to have similar contents although the quality was found to vary. The versions of the PCS that were reviewed were the latest available versions. The location of the emergency plans reviewed is shown in Figure 4.2.

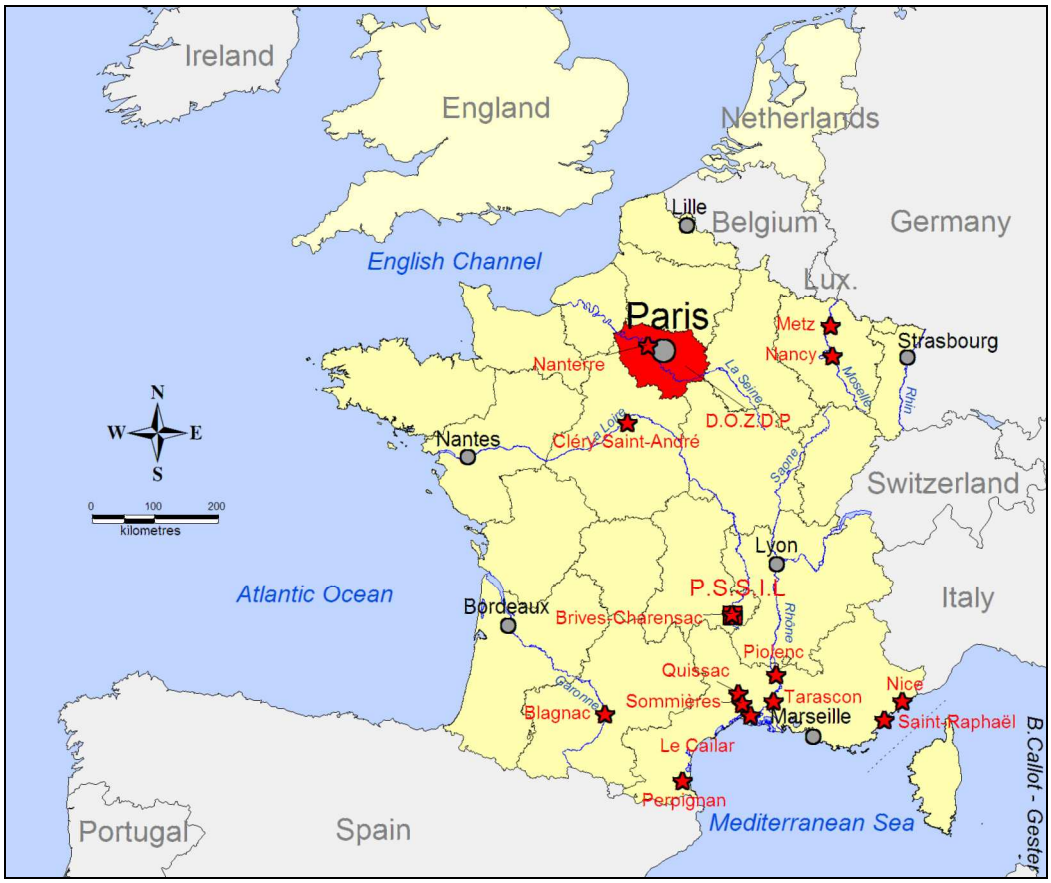


Figure 4.2 Location of the emergency plans reviewed in France

The average score of the PCSs reviewed was 1.9 which rates as an “average” score using the developed metrics. The plans’ scores ranged from 1.1, classed as “considerable room for improvement” to 2.4 classes as “good”. There was not a clear correlation between the score of a plan and the date when the plan was produced or the length of the plan.

Table 4.5 provides the average scores of the metrics for the 16 plans that were reviewed in France. Of the 22 metrics that were used to evaluate the plans, only one metric, “plan activation”, ranked as being “good” and only six other metrics produced an “above average” score.

Table 4.5 Average score of the metrics for France

Metric	Average score	Average quality of the metrics
Plan activation	2.56	Good
Actions, roles and responsibilities	2.54	Above average
Communication with other agencies	2.44	
Communication with the public	2.25	
Flood Warning	2.29	
Flood hazard map	2.25	
Target audience and updating	2.20	
Shelters/Safe havens	2.13	Average
Aims and objectives of plans	2.00	
Potential for NaTech hazards	1.94	
Relationship with complementary emergency plans	1.86	
Flood risk to critical infrastructure	1.81	
Flood risk to residential properties	1.80	
Details of previous floods	1.78	Room for improvement
Training and exercises	1.78	
Risk to people	1.72	
Management of the media	1.67	
Assumptions made by the plan	1.57	
Evacuation routes	1.60	
Recovery	1.56	
Flood risk to business	1.50	
Risk to vulnerable people	1.44	

Key to table - Metric group	Colour code
Objectives, assumptions and target audience	
Organisation and responsibilities	
Communication	
Evacuation	
Flood hazard	
Flood risk to receptors	

Table 4.5 shows that the higher scores (above average and good) are mainly scored by the metrics of type “organisation and responsibilities” and “communication”. Metrics of relating to “Objectives, assumptions and target audience” score around average.

The lowest scores were for the metrics in the category “Flood risk to receptors”. Some metrics that are not covered by PCSs are often included in other documents such as the Plan de Prevention des Risques (PPR) which provides information on the receptors that are at risk from flooding. However, PPRs are used primarily as a development control measure and only 8,000 communes out of 20,000 communes that are exposed to flooding in France are covered by a PPR. When the combined score of a plan at local level (PCS) together with regional level plan was undertaken the combined score was higher than the score of the local emergency plans. It means that some aspects of emergency planning which are not addressed by PCS are covered by others plans at an upper geographical scale. However, there is often a “disconnect” between these plans.

Overall results from the review of the plans are given below.

(i) Organisation and responsibilities

PCS and ORSEC plans have to conform to legal requirements and guidelines. As a consequence the plans are focused on the management of the emergency itself rather than the identification of risk. This explains partly why the metrics that are related to organisation and responsibilities often have a high score and on the other hand the metrics related to receptors at risk (e.g. people, buildings) often have low scores.

The combination and the coordination of plans at different levels are supposed to enhance the effectiveness of the emergency response. For example, the emergency management of networks may be dealt with at a regional level, whilst the issue of evacuation depends on the population in flood prone areas and the available routes. It may be that the communal level of emergency management is too detailed and that there is a requirement for another level of emergency management. The tradition of emergency planning at a national and regional level in France is well developed. The production of PCSs is relatively recent and this may explain the “disconnect” between the plans and the room for improvement. An example of this disconnect is seen for the alarm triggering levels for the city of Sommières as illustrated in Figure 4.3 that are different in the PCS .

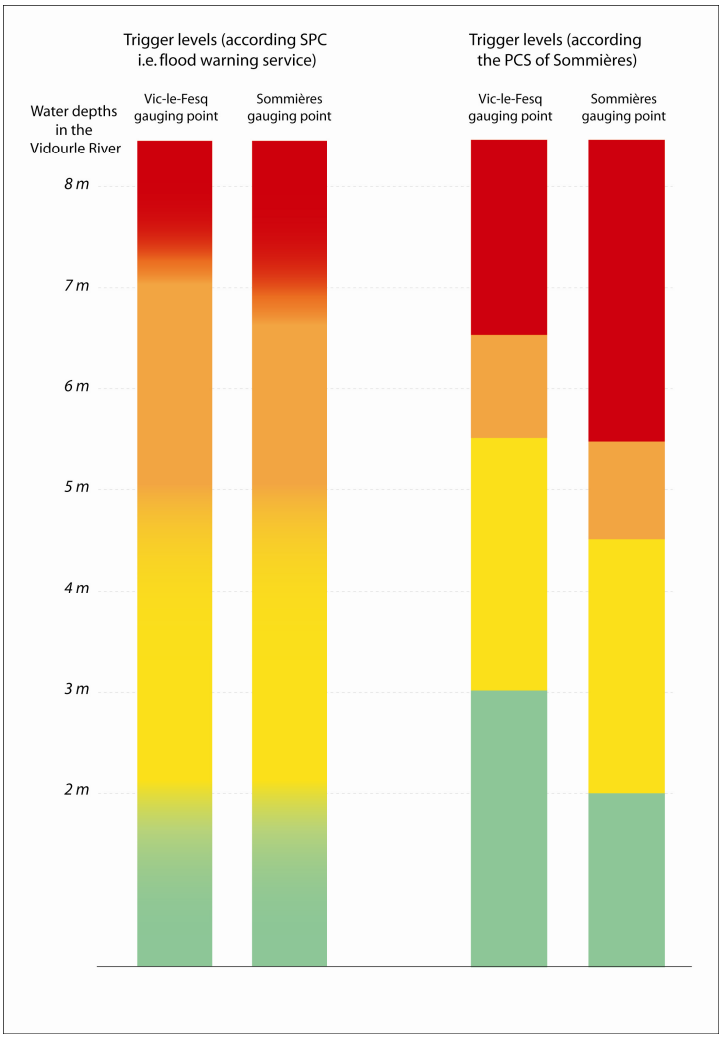


Figure 4.3 **Differences in warning trigger levels between the flood warning service and the PCS for the communes of Sommières**

The post emergency recovery is often not developed in plans except for mentions of assisting homeless people and providing psychological assistance. There was little written in the plans concerning clean up, waste disposal or repairs to public assets. This points to a shortcoming in dealing with the emergency recovery in France.

(ii) Communication

PCSs are becoming more readily available on the internet. However, the online versions are often shorter than the full plan. In many cases the appendices and relevant maps are not disseminated to the population except as a hard copy that is only available at the town hall. There are two ways of addressing the involvement of the public:

i. Municipal authorities consider that emergency is their own responsibility. In this case the people are only informed as the law requires.
ii. The population is clearly involved. In this case, citizens can relay the messages of authorities in the different part of the city. Exercises are planned to involve and to inform the population.

The first case is the one that occurs most frequently. In some communes, the floods are so frequent that authorities think that an exercise is not necessary. However, dissemination of information to the population is being addressed. Prior to 2005, the Document d'Information Communal sur les Risques Majeurs (DICRIM) defined a method to inform the public of the risks in their commune. The DICRIM has been integrated to PCS as a form of dissemination.

The scores are also generally low for the management of media. There is room for improvement in this field and in France there have been some examples of municipal councils that have lost elections owing to poor communication during an emergency.

(iii) Evacuation

Evacuation is not well addressed by the plans that were reviewed. No plan contained an evacuation map. This may be due to the fact that evacuation is not really a responsibility of municipal authorities. Many mayors think that this is the state's responsibility. However, the key question of the responsibility of evacuation is unclear.

(iv) Flood hazard

Many plans lacked relevant maps. Flood hazard maps were frequently included but in a basic form. The flood zone is shown but depth data is rarely shown. Flow velocities did not appear and neither did major flow routes. There is often useful information on the flood hazards and previous floods contained in the Plan de Prevention des Risques (PPR); however, the PCSs often do not refer to these plans. Flood warning levels are generally well defined. However, in several plans, the intermediary levels of flood are not addressed.

(v) Flood risk to receptors

Risk to vulnerable people (1.4) and risk to business (1.5) were the lowest scoring metrics. This was a shortcoming in all the PCSs reviewed. There is a lack of:

- Maps of vulnerable people, although PCSs often include lists, which are not in the public domain, detailing shelters, vulnerable people or resources for emergency management such as food, blankets and drinking water.
- Assessment of the assets that are at risk.

The PCSs are produced in order to save human lives and to minimize the failure of public infrastructures. The protection of goods and property is not considered as a major objective owing to the French national

insurance system that covers damage to properties and businesses that occurs as a result of natural hazards.

4.4 Review of emergency plans in the Netherlands

The review of the Dutch emergency plans focused on the regional plans developed by either a cooperation of municipalities and services or by a Safety Region. Eleven regional plans were reviewed; in addition the National Response Plan was reviewed as well. Of the 25 planned Safety Regions in the Netherlands, three regions are not threatened by floods. These regions might prepare for the sheltering of evacuees though, but such plans were not considered for this research. An overview of the reviewed plans is given in Table 4.6. Figure 4.4 shows the regions for which plans were reviewed.

Table 4.6 List of flood emergency plans reviewed for the Netherlands

Name of plan	Type of plan	Date of plan	Plan score	Length of plan (pages)
Plan 1	Safety Region plan	Version 1.0, 5 June 2007	2.32	286
Plan 2	Safety Region plan	26 March 2009	1.82	76
Plan 3	Safety Region plan	May 2009	1.64	109
Plan 4	Safety Region plan	Version 1.0, 3 December 2008	2.23	88
Plan 5	Safety Region plan	Version 3.0, November 2009 (draft)	1.73	54
Plan 6	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	15 September, 2005	1.77	188
Plan 7	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	Version 1.1, 14 August, 2007	1.23	41
Plan 8	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	Version 2, 1 October 2007	1.45	31
Plan 9	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	Version 2.3, December 2009 (draft)	1.33	36
Plan 10	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	August 2008 (draft)	1.59	55
Plan 11	Safety Region plan	February 2010 (draft)	1.64	57
National Response Plan	National Response Plan	August 2008	1.55	157

Figure 4.4 Availability of emergency plans for Safety Regions in the Netherlands

The average score of the regional plans (thus excluding the National Response plan) reviewed was 1.7 which rates as a “room for improvement” score using the developed metrics. The plans’ scores ranged from 1.2, classed as “considerable room for improvement” to 2.3 classes as “above average”. No relation was found between the age of the plan and the score. The two plans that scored “above average” are from 2007 and 2008. The lowest scoring plan was drawn up in 2009; however, this was a draft version.

The disaster management plans in the Netherlands are very diverse. Final as well as draft plans exist, and some plans are produced by a Safety Region while others are drawn up with the cooperation of parties such as Water Boards, municipalities and the fire brigade. This diversity in the parties involved in the production of the plans is probably due to the fact that the establishment of Safety Regions as well as the responsibility for the production of emergency plans by the Safety Regions is still under discussion.

The plans which are developed by the Safety Regions scored higher than the plans drawn up by a cooperation of regional parties. The plans drawn up by the Safety Region are longer and show a more

uniform format and layout than the regional plans. The quality of the plans also seems to be related to the area the plan covered. For example, the plans formulated for areas with a high number of inhabitants or high economical value generally scored higher and covered more aspects than those where the level of risk was lower.

In general it can be said that the look and content of the reviewed plans differed greatly. This is due to the fact that in the Netherlands no guidelines or predefined format is made available to planners. It was seen though that some plans have similar layout and addressed the same items.

Table 4.7 provides the average scores of the metrics for the 11 plans that were reviewed in the Netherlands.

Table 4.7 Results metrics for the review of the Dutch flood emergency plans

Metric	Average score	Average quality of the metrics
Aims and objectives of plans	2.58	Good
Flood hazard map	2.25	Above average
Plan activation	2.25	
Actions, roles and responsibilities	2.25	
Communication with other agencies	2.18	
Communication with the public	2.17	
Flood Warning	1.83	Average
Target audience and updating	1.92	
Risk to people	1.83	
Evacuation routes	1.75	
Management of the media	1.67	Room for improvement
Assumptions made by the plan	1.67	
Training and exercises	1.50	
Relationship with complementary emergency plans	1.58	
Flood risk to critical infrastructure	1.42	
Potential for NaTech hazards	1.33	Considerable room for improvement
Shelters/Safe havens	1.33	
Risk to vulnerable people	1.25	
Flood risk to residential properties	1.17	
Flood risk to business	1.17	
Details of previous floods	1.08	
Recovery	1.08	

Key to table - Metric group	Colour code
Objectives, assumptions and target audience	
Organisation and responsibilities	
Communication	
Evacuation	
Flood hazard	
Flood risk to receptors	

Metrics of falling into the category of “Objectives, assumptions and target audience” and “Communication” generally scored “Average” or higher. Metrics relating to “organization and responsibility”also scored relatively highly. Metrics relating to “Evacuation” and “Risk to receptors” generally scored below average.

(i) Objectives, assumptions and target audience

The metric “Aims and objectives” was well defined in the Dutch plans. The aim of the plan was extensively described. The assumptions made by the plan were often not addressed.

(ii) Organisation and responsibilities

Much emphasis was given to “Actions, roles and responsibilities”. However, some plans had low scores for this metric owing to the fact that detailed descriptions of the different roles are often part of related plans.

Some of the plans did not include all the metrics. Reference was made to other plans where these metrics were said to be covered. During an event it will be crucial for the effective management of the event for the referenced plans to be readily available to the planners. The relationship with other plans had a low score. Often a reference was made to other plans, but the location of these plans and other relevant details were not included.

Training and exercise is often described in minimal detail or not mentioned at all; little attention is given to the aspect ‘recovery’.

(iii) Evacuation

Evacuation routes and shelters/safe havens are often described in minimal detail or not mentioned at all. However, in many plans the evacuation of cattle and pets is included. Large areas susceptible to flooding are farm land and house significant numbers of cattle.The evacuation of animals needs to be taken into account. In one plan it is stated that people should gather in libraries and schools. However, no map was included showing the location of schools and libraries, neither was the capacity of these locations included or the location in relation to the flood risk.

(iv) Flood hazard

A map of flood extent was almost always a part of the plan. Some plans also include water depth and velocity maps, although some only show the temporal propagation of the flood. Little attention is given todetails of previous flooding. This may be because many areas in the Netherlands have not encountered flooding for several decades.

(v) Flood risk to receptors

For the metric ‘Risk to people’ the number of people threatened by flooding was mentioned, but an extensive evaluation of casualties and loss of life was not performed. The flood risk to critical infrastructure was often described extensively in the text. Maps showing this information were lacking, which resulted in a lower score for this metric. NaTech hazards are often described in minimal detail or not mentioned at all. Aspects which require detailed and expert evaluation e.g. flood risk to residential property and businesses and risk to vulnerable people score low.

4.5 Validation of the metric scores

In order to assess the “subjectiveness” of the metrics three members of the research team who had not been responsible for the evaluation of the emergency plans reviewed two plans from each country in order to compare their scores with those obtained by the original reviewer. The results of this exercise are briefly detailed in the following section. The overall results are provided in Appendix D.

The average scores of the original evaluation and the second review do not differ greatly, (a maximum of 0.2 points was found between the average scores), although a shift from one category to another was noted for two of the six reviewed plans. For each plan that was reviewed approximately one third of the metrics were scored differently to the original evaluation.

4.5.1 *Overview and conclusions on emergency planning in England and Wales, France and the Netherlands*

For each country an evaluation of emergency plans was performed. This section gives an overview of the results and provides a comparison between the countries. An evaluation was made of the quality of the plans using the metrics developed within the project. An overview was gained of the level of detail at which the metrics were addressed within the plans. Table 4.8 shows the results on the scoring of the plans.

Table 4.8 The overall results of the scoring of the emergency plans per country

	England and Wales	France	The Netherlands
Average score of plans	1.9	1.9	1.7
Average plan score category	Average	Average	Room for improvement
Range of scores	1.3 to 2.3	1.1 to 2.4	1.2 to 2.3

Both the average score of the plans as well as the range of scores were similar between the three countries. It is important to note that many plans reviewed were under development or a draft version. The plans score an average or close to average, but could be improved on several points.

Figure 4.5 shows that there is a relationship between the total length of emergency plans, including appendices, and the mean metric score for England and Wales and to a lesser degree the Netherlands. The longest plan reviewed in England and Wales was used in November 2009 in an extreme flood event and received very positive feedback from end users. This may indicate that “ease of navigation” of the plan is more important than plan length. In France there appears to be no correlation between the metric score and the plan length.

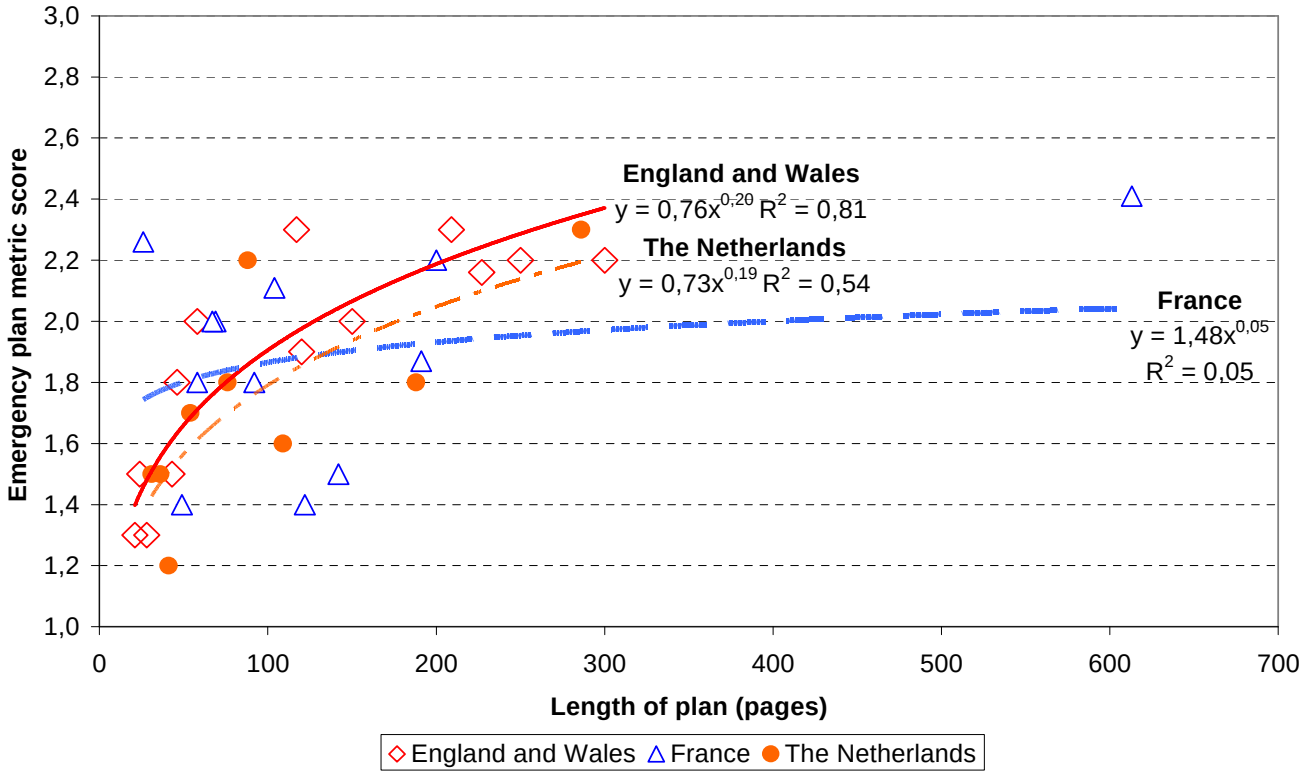


Figure 4.5 **Correlation between length of emergency plan and metric scores for England and Wales, France and the Netherlands**

An overview of the results per metric group is given in Table 4.9. A comparison between the average metric scores for each country is illustrated in Figure 4.6.

Metrics related to organisational aspects of the plan such as: plan activation; roles and responsibilities; communication with other agencies; and target audience and updating scored well in all three countries. The assumptions made by the plan do not appear to be well defined in all three countries. Details of previous floods although covered reasonably well in England and Wales and France are not covered well in the Netherlands; this may be as a result of there have been no major flood events in the Netherlands since 1953.

Metrics related to the possible impacts of floods on receptors such as businesses; critical infrastructure; people; vulnerable people and NaTechs all score well below average in all three countries as well as the metrics concerned with evacuation aspects. The metric for the relationship between complementary plans in England and Wales scored “above average”; however, in France and the Netherlands this metric scored “below average” indicating that there may be a “disconnect” between different complementary plans and that if other plans are referenced there is often not a detailed link provided to them

The metrics provides a measure for quantifying plans making it possible to measure and compare plans. The method in which the metrics are applied is flexible as the metrics themselves can be detailed, metrics can be added or omitted depending on the requirements one wishes to apply for evaluation.

Table 4.9 **Overview of results for each metric group in England and Wales, France and the Netherlands**

Score category	England and Wales	France	The Netherlands
Maximum metric score	Above average	Good (one metric)	Good (one metric)
Range of metric scores	1.31 to 2.46	1.44 to 2.56	1.08 to 2.58
Metric scores with average and higher scores	Objectives, assumptions and target audience Organization and responsibility Flood hazard	Organization and responsibility Communication	Objectives, assumptions and target audience Communication
Metric scores that are “average”, or where a large spread of scores occurred	Communication	Flood hazard Objectives, assumptions and target audience Evacuation	Flood hazard Organization and responsibility
Metrics scores with ‘Room for improvement’ or lower	Flood risk to receptors Evacuation	Flood risk to receptors	Flood risk to receptors Evacuation

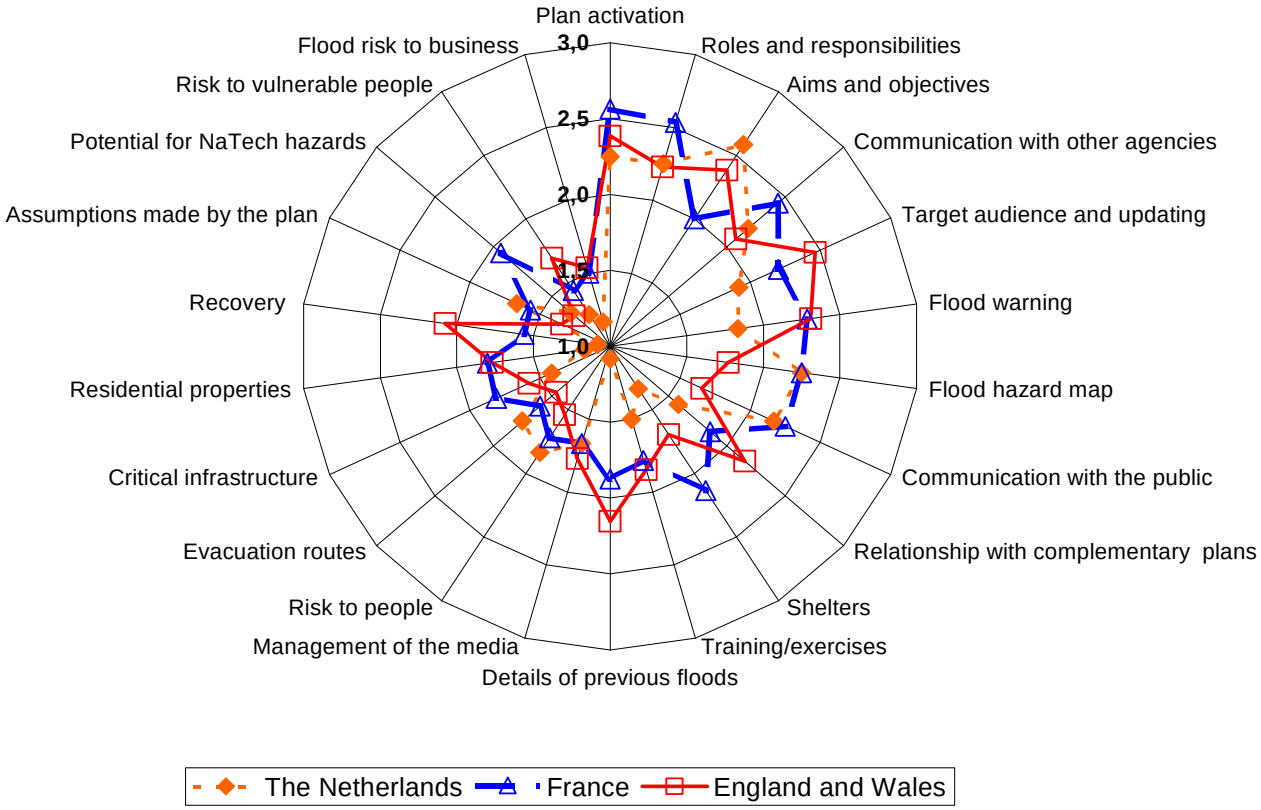


Figure 4.6 **Comparison between mean metric scores for emergency plans in England and Wales, France and the Netherlands**

5 Engagement of stakeholders on emergency plan requirements

5.1 Introduction

One of the goals of the research was to provide insight into which elements should be addressed in an emergency plan including the level of detail. Through an extensive online survey in England and Wales, France and the Netherlands, disseminated among stakeholders, the views of the actual planners were gathered. This chapter summarizes the details of the research and results.

In January 2010 an online survey was sent to stakeholders in England and Wales, France and the Netherlands. The questions focused on the requirement for information in the plan development stage, the usefulness and required level of detail. In addition the responders were asked which criteria make a plan effective. The results on effectiveness are discussed in chapter 6.

5.1.1 England and Wales

In England and Wales the survey was disseminated via a number of routes including emails to all the Local Resilience Forums, a link to the survey in an emergency management bulletin distributed by the Emergency Management Society and also via the Environment Agency who sent the survey to contacts they had in Local Resilience Forums. A copy of the survey that was sent out to emergency planners and responders in England and Wales is included in Appendix E.

A total of 95 people undertook the survey of these 82 people actively engaged in preparing Multi-Agency Flood Plans, 12 did not and one did not know. The breakdown of the organisations who responded to the survey is given in Table 5.1.

Table 5.1 Breakdown by organisation response to the England and Wales survey

Type of organisation	Percentage of responses
Emergency services (e.g. Fire and Rescue Services, Police Force)	21.2 %
Environment Agency	2.4 %
Health (e.g. Ambulance Service, NHS Trust)	8.2 %
Health and Safety Executive	0.0 %
Local Authority	51.8 %
Transport (e.g. Highways Agency, Network Rail)	4.7 %
Utility (e.g. communications, electricity, gas, water)	4.7 %
Voluntary Organisation	0.0 %
Other	7.1 %

The responders to the survey were asked which Environment Agency Region their MAFP fell under; the results of this are shown in Table 5.2. The Environment Agency regions are shown in Figure 5.1.

Figure 5.1 Environment Agency regions

Table 5.2 Response to the question which Environment Agency Region does your plan fall under

Environment Agency Region	Percentage of responses
Anglian Region	8.3%
Midlands Region	10.7%
North East Region	11.9%
North West Region	32.1%
Southern Region	13.1%
South West Region	11.9%
Thames Region	8.3%
Welsh Region	1.2%
Don't know	2.4%

5.1.2 France

A link to the survey was sent to some 250 people and organisations throughout France involved in the production of emergency plans. The French survey is given in Appendix F. A total of 77 people completed the survey. The target audience for the survey comprised:

- The emergency planner's service: SDIS "Service departmental d'Incendie et de Secours" (department service of firemen)

- The prefecture: head of state service in each department : SIDPC (Service Interministériel de Défense et de Protection Civiles).

The geographical distribution of the responses to the French survey is shown in Figure 5.2. Responses were numerous in large river basins such as Loire basin and Seine river basin where many studies have shown the importance of flood risk. Many responses also came from the southern France region which have been hit by a number of flash floods in the past decade. In those regions, the fact that the GESTER Laboratory at the University of Montepellier III is known by stakeholders probably increased the response rate.

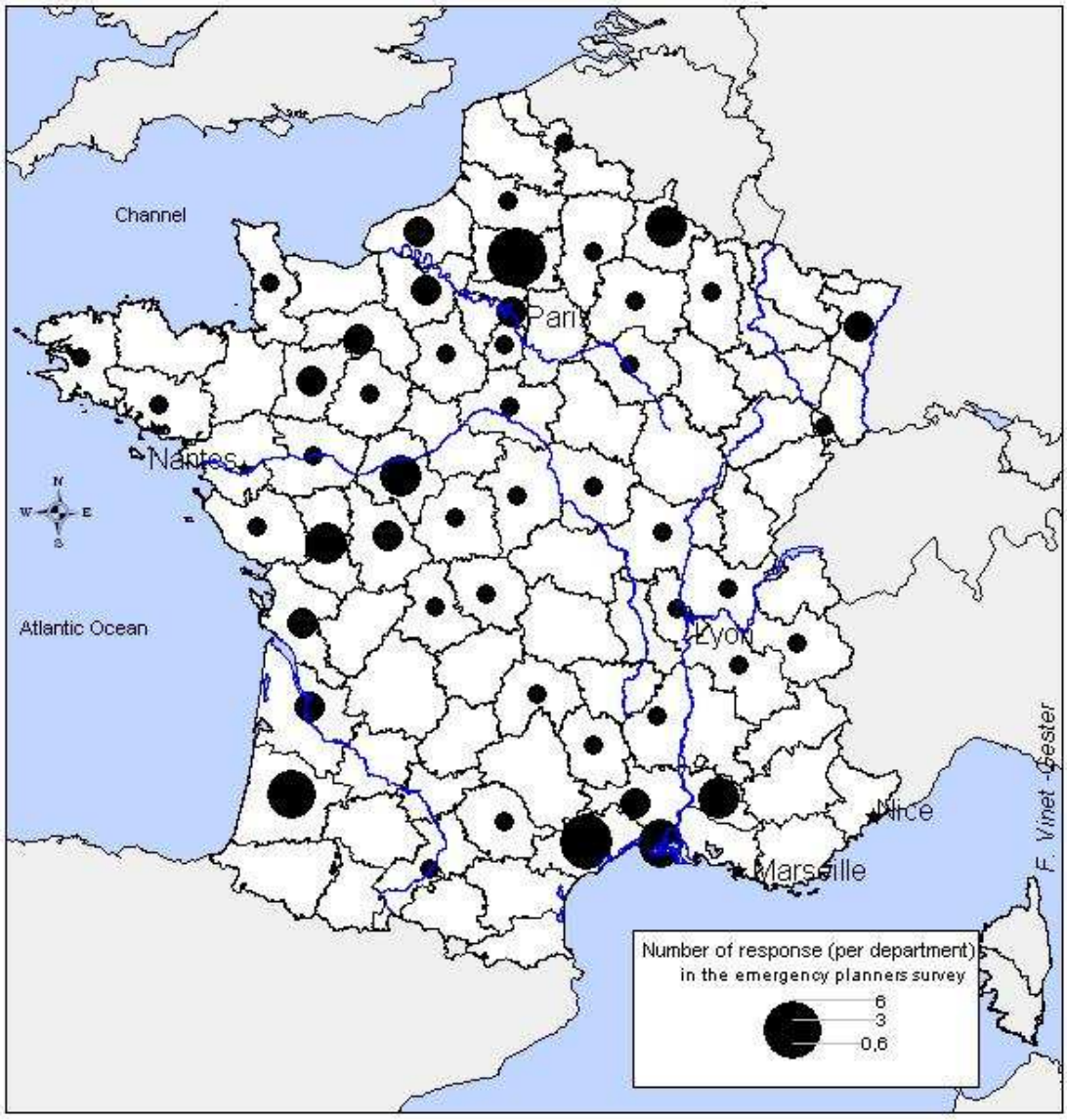


Figure 5.2 Distribution of the responses to the emergency managers survey in France

5.1.3 *The Netherlands*

In the Netherlands 45 stakeholders have completed the survey of which 36 people are actively involved in the preparation of emergency plans, 6 were not and 3 did not know. The breakdown of the type of plans people are working on is given in Table 5.3.

Table 5.3 Breakdown by organisation response to the survey (The Netherlands)

Type of plan	Percentage of responses
Municipal	0.0%
Safety Region	44.7%
National	13.2%
Not applicable	42.1%

5.2 Types of floods that are planned for in England and Wales, France and the Netherlands

The responders were asked which type of flood they plan for. This question was included to see if there is an emphasis on certain types of flood risks. The types of flood risks the responders could choose from corresponded to the types of floods which can be encountered within the different countries. As an example, flash floods are highly unlikely in the Netherlands. Table 5.4 details the types of floods that the responders of the floods deal with.

Table 5.4 Percentage of responders who plan for a particular type of flood

Type of floods	England and Wales:	France:	The Netherlands
Fluvial floods	96.3%	89.7%	60.5 % (Large rivers)
Surface water flooding	90.2%	Not included as an option	Not included as an option
Flooding related to reservoir incidents	59.8%	54.0%	Not included as an option
Flash floods	54.9%	49.4%	Not included as an option
Urban drainage floods	45.1%	46.0%	Not included as an option
Coastal floods	42.7%	39.1%	74.4 %
Groundwater flooding	39.0%	25.3%	Not included as an option
Regional waters (smaller rivers and brooks, canals and polder drainage systems)	Not included as an option	Not included as an option	67.4 %
Other types of floods	11.0%	12.6%	Not included as an option

In England and Wales and France the majority of the responders plan for fluvial floods. For the Netherlands it is seen that most planning is done for coastal flooding. Many of the responders in France and England and Wales also have an involvement in floods related to reservoir incidents, as well as floods related to urban drainage. Of the “other” types of floods that were stated to be planned for, these included

flooding from canals and from burst water mains. In the Netherlands emphasis is also given to planning for floods from regional waters (i.e. small brooks and polder drainage).

5.3 Information useful to the formulation of an emergency plan

5.3.1 Usefulness of information

As part of the survey the responders where questioned as to the "usefulness" of ten pieces of information in helping them formulate emergency plans for floods. They were asked to "score" the usefulness of the information from 1 to 5, with 1 = "not very useful" and 5 = "very useful". There was also a "Don't know option". The full results of the survey are given in Appendices G, H and I.

Table 5.5 provides a summary of the mean survey scores of the usefulness of information in the formulation of emergency management plans in England and Wales and in France.

Table 5.5 Mean survey scores for the usefulness of information, if it were available, for emergency management plans in England and Wales and France

Information type	England and Wales	France
Potential damage to critical infrastructure	4.60	4.24
The accessibility of inundated roads to emergency services and other vehicles for different flood scenarios	4.53	4.75
The inter-dependencies between at risk critical infrastructure	4.44	3.71
Other hazards triggered as the result of flooding	4.33	4.21
Optimal evacuation routes from the inundated area	4.28	3.75
The time to evacuate people from areas at risk of flooding	4.16	4.18
How improvements in the dissemination of flood warnings could reduce the risk to people	4.06	3.59
Optimum location of shelters and rest areas	3.93	3.83
Probability of buildings collapsing during a flood	3.77	3.42
Potential injuries and loss of life for a range of flood scenarios	3.55	3.77

Note: The Dutch responders were given the options 'not useful' or 'useful' and results for the Netherlands are therefore not included in this table

It is interesting to note that in both England and Wales and France, the top two most useful pieces of information were found to be accessibility of inundated roads and the impacts of floods on critical infrastructure. In France 83% of responders said that it would be "very useful" to get more information about the accessibility of roads to emergency services and other vehicles, (another 12% stated this information would be "useful"). In England and Wales 76% marked information on 'Potential damage to critical infrastructure' to be "very useful". The second and third most popular answer in France regarding usefulness of information related to impacts on critical infrastructure and NaTechs. The lowest ranked pieces of information were for 'Probability of buildings collapsing during a flood' and 'Potential injuries and loss of life for a range of flood scenarios'.

Some 89% of the responders of the English and Welsh survey and 90% of the Dutch responders said that if they had all the above information available to them that it would be useful in formulating their MAFPs. For France only 50% of the responders answered this question positively.

Figure 5.3 shows the normalised metric scores for five metrics compared with the normalised usefulness of the information as perceived by the stakeholders who answered the survey. The normalisation used was:

$$x_{norm} = (x_i - Min)/(Max - Min)$$

Where x_i is the individual metric or usefulness score, Min and Max are the absolute minimum and maximum values in each range (1 and 3 for metric scores, 1 and 5 for usefulness scores). This gives a normalised value (x_{norm}) that ranges between 0 and 1.

The perceived "usefulness" of information on: loss of life; damage to critical infrastructure; other hazards resulting from floods; evacuation routes; and shelters is similar in both England and Wales and France. The mean metric scores shown in Figure 5.3 for the two countries are relatively low indicating that there is a discrepancy between what the stakeholders perceive to be useful and the information that is actually provided in emergency plans.

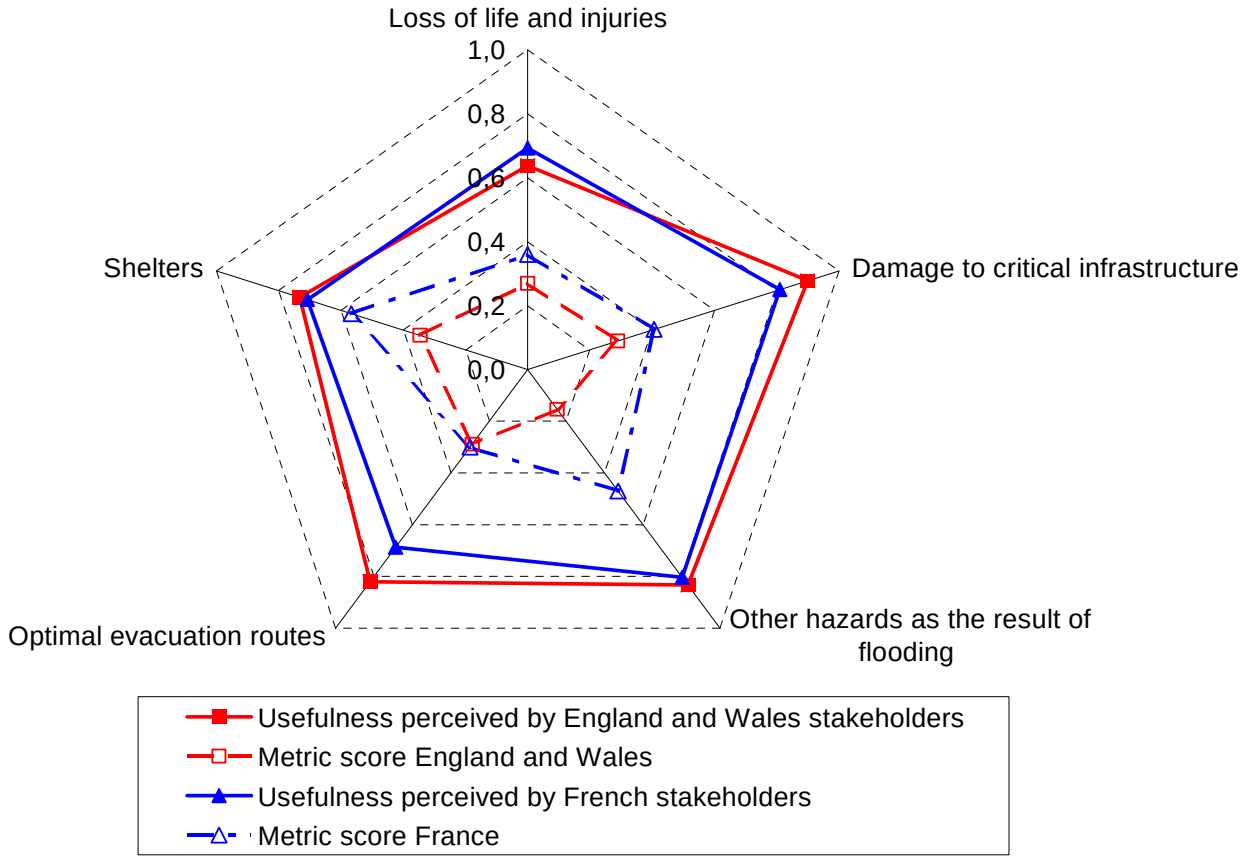


Figure 5.3 **Comparison of the normalised scores for the usefulness of information as perceived by the stakeholders and the metric scores for England and Wales and France**

5.3.2 Additional required information

The responders were asked if there was any other information related to the impacts of flooding in their area, either not currently available or listed above, that they would like to have available to assist them in formulating emergency plans. The results are described for each country below. The full list of comments is provided in Appendices G, H and I.

England and Wales
The responses to this question can be broadly grouped into the following categories:

- Flood hazard maps;
- Critical infrastructure;
- Evacuation and transport;
- Trigger and forecast levels;
- Flood warnings;
- Other comments.

One responder made the pertinent comment that "*As with all these things, there is a balance to be struck between having enough information to plan efficiently and having so much information that the planner gets flooded.*"

It is interesting to note that there were several comments relating to flood mapping indicating the need for flood depth, velocity and/or a combination of these two parameters to be included on the flood map. Many responders pointed to the need for more information not just on the location of critical infrastructure but also on the consequences relating to the failure of certain pieces of critical infrastructure. There were also comments regarding the difficulty of obtaining information on critical infrastructure although the responders did not specify which types of critical infrastructure.

Responders also commented that the information on evacuation times for reservoir failure scenarios and vulnerable people would be useful. Several comments were made about the need for information on the probability of road inundation and other transport links.

One responder commented on the need for the availability of forecast river levels on the internet and several people commented on the need for clarification of trigger levels for flooding of areas. The comments related to flood warning mainly related to possible changes in the system of warning in England and Wales which is still in the process of being decided.

Of the other comments these mainly related to information on surface water flooding that would be of use although one responder rather worrying stated "*The majority of the information in Question 5 I don't currently have.*"

France
In France 37 people responded to the survey regarding what other information they would need to formulate or improve emergency plans. The answers can be classified as follows:

- Flood hazards data and data required to map flooding (e.g. topographical data);
- Availability of data and tools to assess impacts;
- Adaptability of resources to the crisis;
- Assessment of potential failure in the rescue organisation and the potential failure of the other actors involved in emergency management;
- The need for information linked to the specific features of a region.

The first requirement concerns the evaluation and the mapping of flood hazard. In France there is still room for improvement in the tools, data and methods to assess flood hazard. For example one responder stated that there is a need for *"a tool to correlate water levels and inundated zone"* summarises this demand. Another recurrent need was flood warning systems for ungauged catchments.

The emergency managers also asked for information concerning the impacts of floods on:

- Networks (e.g. roads, electricity or drinking water supply system)
- Sectors that are not inundated but isolated by the floodwater
- The capacity of the rescue organisation

Sometimes tools and data required by the responders are already available. The survey indicated that many responders do not have a complete knowledge of tools available. In some cases information is not used because of the cost (e.g. topographic data and databases of assets such as buildings).

One way emergency planning could be improved in France is to share and standardise GIS information. It is important that services in charge of emergency planning use compatible tools and data. One important constraint is the lack of accurate information on assets at risk. A responder to the survey stated that they would like to be able "*to download all the layers of PPR (Predictable Risk Prevention Plans) in an electronic format to allow them to be imported into our GIS*". The paradox is that PPR data are supposed to be freely available and full accessible.

Emergency planners are also preoccupied with the internal resources of their own organisation in case of crisis. A responder says that "*An assessment of impacts of floods on emergency actors (health service for example) would be necessary in order to evaluate the capacity of emergency and rescue services to fulfil unexpected task"*. Another responder stated that "*The failure of other actors or lack of resources can provide more work to emergency services. In the same way, a flood can make populations vulnerable and requires unexpected rescue actions (e.g. transportation of doctors in the flooded area)"*.

Many responses concerned demands that were very specific to their particular area, for example how can new tools and/or research programmes can respond to specific demands such as role of debris flows and railways lines blocking flow routes. An international cooperation in the sharing of tools and knowledge can provide some responses to those specific needs. The full list of comments is provided in Appendix I

The Netherlands
The Dutch responders listed the following additional groups of information:

- Technical aspects such as strength of flood defences, uncertainty in flood forecasting results;
- Relation between Safety Region and Regional – National plans;
- In relation to casualties: Effect of public accessible information on the behaviour of the public, number of inhabitants, determination of shelters;
- Critical infrastructure (such as energy and drinking water providers) and an overview of usable roads;
- Environmental effects.

When comparing these results to the results from the review of the emergency plans, it can be seen that the first two types of information, technical aspects and relations between the different organisations, are often part of the plans already. The other information types are seen to be of a lower standard in many plans.

5.3.3 Appropriate level of detail for information and data

The responders were asked to "score" the level of detail they felt there should be for a variety of subjects in an emergency management plan. The level of detail of the information was scored from 1 to 5, with 1 =

"not detailed in the plan" and 5 = "very detailed". There was also a "Don't know option". The full results of the survey are given in Appendices G, H, I. Table 5.6 provides details of the mean survey scores of the detail of information that should be in emergency plans.

Table 5.6 Mean survey scores for the level of detail of information and data required for emergency management plans in England and Wales, France and the Netherlands

Information type	England and Wales	France	Netherlands
Impacts of floods on critical infrastructure	4.49	4.16	4.13
Flood map showing flood extent	4.41	4.52	4.37
Flood warning lead times	4.13	3.96	4.33
Flood map showing depths, velocities and flow routes	4.08	4.27	4.25
Evacuation routes and times	4.04	3.78	4.30
Flood risk to properties	3.97	3.36	
Shelters, rest areas and safe havens	3.96	4.02	3.81
Flood risk to people in terms of potential injuries and loss of life	3.88	3.32	
Availability of the appropriate resources	3.81	4.03	3.34
Potential for other hazards that may occur because of flooding	3.71	3.63	3.74
Implementation of measures (e.g. sand bags, temporary defences)	3.57	3.27	3.59

For specific pieces of information, differences are seen between the three countries, e.g. availability of resources scores high in France, intermediate in the Netherland and low in England and Wales. On the other hand it is seen that England and the Netherlands have similar items scoring the five highest scores. For France these include the first three items as well as the sixth item.

England and Wales
It is interesting to note that in terms of the level of detail of information of the pieces of information listed above from the review of the Multi Agency Flood Plans (MAFPs) using the developed metrics most of these items fell into the category of either "room for improvement" or "considerable room for improvement". This would seem to suggest that apart from flood warning times there is not enough "relevant" information available to emergency planners to help them with the formulation of MAFPs.

With regards to critical infrastructure that was placed at the top of the list in terms of the level of detail required one responder stated that:

"*There is great reluctance from utility companies to share data on assets and their vulnerability to flooding, partially because they do not have the information on their risk ('well it depends how much rain falls' etc), but mainly because they just don't see what the Local Resilience Forum would do with the information. They are concerned that stating a site is at risk will either result in the gold/silver command taking unilateral action without consulting them, or alternatively will put pressure on them to take action to reduce the risk before it floods. Either way, the benefits have yet to be fully explained, and thus the key infrastructure remains a struggle to obtain*."

France
In terms of level of detail required flood hazard maps scored highly and many responders wanted flood maps that show information about depth, velocities and flow routes. Impacts of flooding on critical infrastructure featured heavily. However, similar to England and Wales the impacts of flooding of people in terms of loss of life did not feature highly. This is interesting as the comments of the responders indicate that emergency managers are focused on the safety of human life and the protection of public infrastructures and services rather than in the defence of properties and goods.

The Netherlands
In the Netherlands evacuation routes and times were seen as the most important piece of information. In January 1995 some 250,000 people had to be evacuated in the Netherlands as a result of high water levels on the River Rhine and River Meuse. As a result evacuation may be higher up the emergency planning agenda in the Netherlands than in France or England and Wales.

5.4 Communication, responsibilities and assumptions

The responders were asked to "score" the level of detail for issues relating to communication, responsibilities and assumptions they felt there should be for a variety of subjects in an emergency plan. The level of detail of the information was scored from 1 to 5, with 1 = "not detailed in the plan" and 5 = "very detailed". There was also a "Don't know option".

Table 5.7 provides details of the scoring by responders of the level of detail of information that should be in emergency plans of various items related to communication, responsibilities and assumptions.

Table 5.7 Mean survey scores for the level of detail of communication, responsibilities and assumptions required for emergency management plans in England and Wales, France and the Netherlands

Information type	England and Wales	France	Netherlands
Plan activation (e.g. trigger levels etc)	4.52	4.14	4.35
Communication with other agencies	4.48	3.64	4.32
Communication with the public	4.39	3.95	3.95
Communication with the media	4.28	3.39	3.99
Relationship with complementary emergency management plans	4.05	3.65	3.58
Details of recovery	3.85	3.14	3.06
Aims, objectives and assumptions of plan	3.72	3.50	3.35
Training and exercises	3.56	3.46	3.27
Target audience of plan	3.53	4.02	3.70
Details of modifications to and updating of the plan	3.44	3.02	3.35

The item plan activation has the highest required level of detail for the three countries. For England and Wales and the Netherlands it is seen that a higher level of detail is wanted for the items on communication (second to fourth items). Recovery and updating of the plan do not need to be specified in a high detail level.

England and Wales:
It is interesting to note that in the review of the MAFPs, issues related to plan activation, communication with other agencies and the media, relationship with complementary plans all scored relatively well. It would appear that issues related to communication and responsibilities are currently relatively well covered by MAFP. It should be noted that the assumptions made by MAFPs were often not explicitly stated.

France
Information regarding communication can be classified in two groups. Information and communication required before the crisis such as target audience, plan activation and communication to public scored "above average". Items related to the post disaster phase are often neglected.

The Netherlands
Issues relating to 'Training and exercises' and 'Relationship with complementary emergency plans' were found from the review of the plan to rate as "Room for improvement". It was seen that for these issues a

low detail was provided in the plans. The lowest ranked item 'Recovery' scored a "Considerable room for improvement" in the review of the emergency plans.

5.5 Comparison of plan metric scores and the level of detail required by stakeholders

Figure 5.4 shows the normalised metric scores for seven metrics compared with the normalised level of detail required in a plan as perceived by the stakeholders who answered the survey. The perceived "level of detail" of information on: flood risk to people; flood risk to property; critical infrastructure; evacuation; NaTechs; shelters; and flood maps is similar in all three countries. The plan mean metric scores shown in Figure 5.4 for the three countries are relatively low indicating that there is a discrepancy between the stakeholders required level of detail and the information that is actually provided in emergency plans.

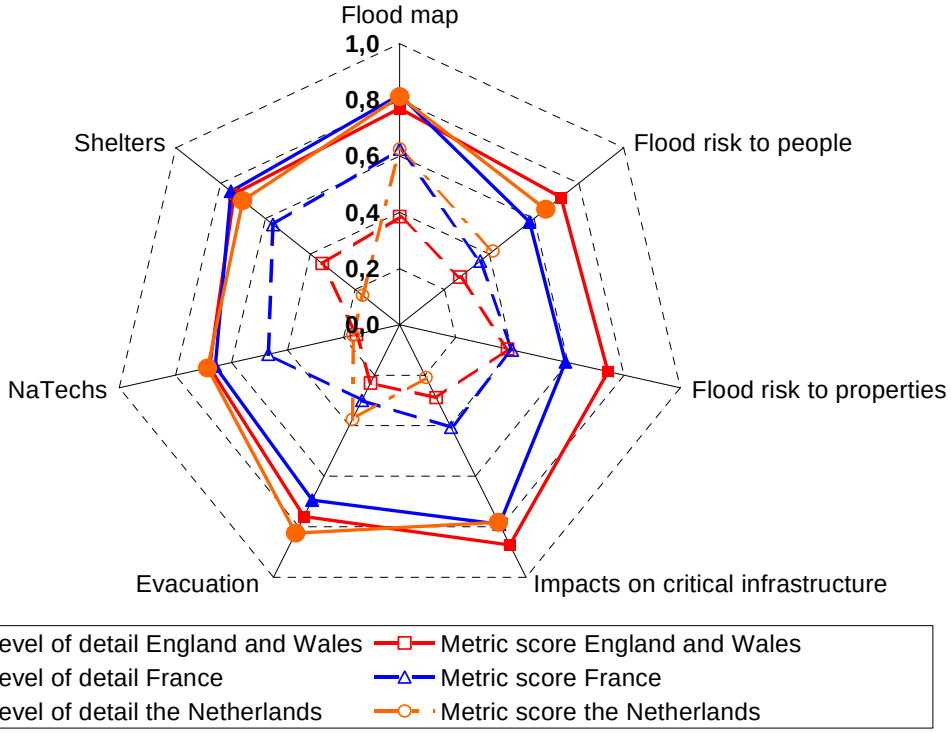


Figure 5.4 **Comparison of the normalised scores related to receptors for the required detail of information as perceived by the stakeholders and the metric scores for England and Wales, France and the Netherlands**

Figure 5.5 shows the normalised metric scores for seven further metrics compared with the normalised level of detail required in a plan as perceived by the stakeholders who answered the survey. The perceived "level of detail" of information on issues related to communication and organisational aspects of the plans are similar in all three countries. The plan mean metric scores shown in Figure 5.5 for the three countries are much closer to the perceived level of detail required by the stakeholders than the metrics shown in Figure 5.4 related to risk to the receptors. There are some exceptions including communication with the media; details of recovery in France and the Netherlands. However, in general these aspects are covered in more detail.

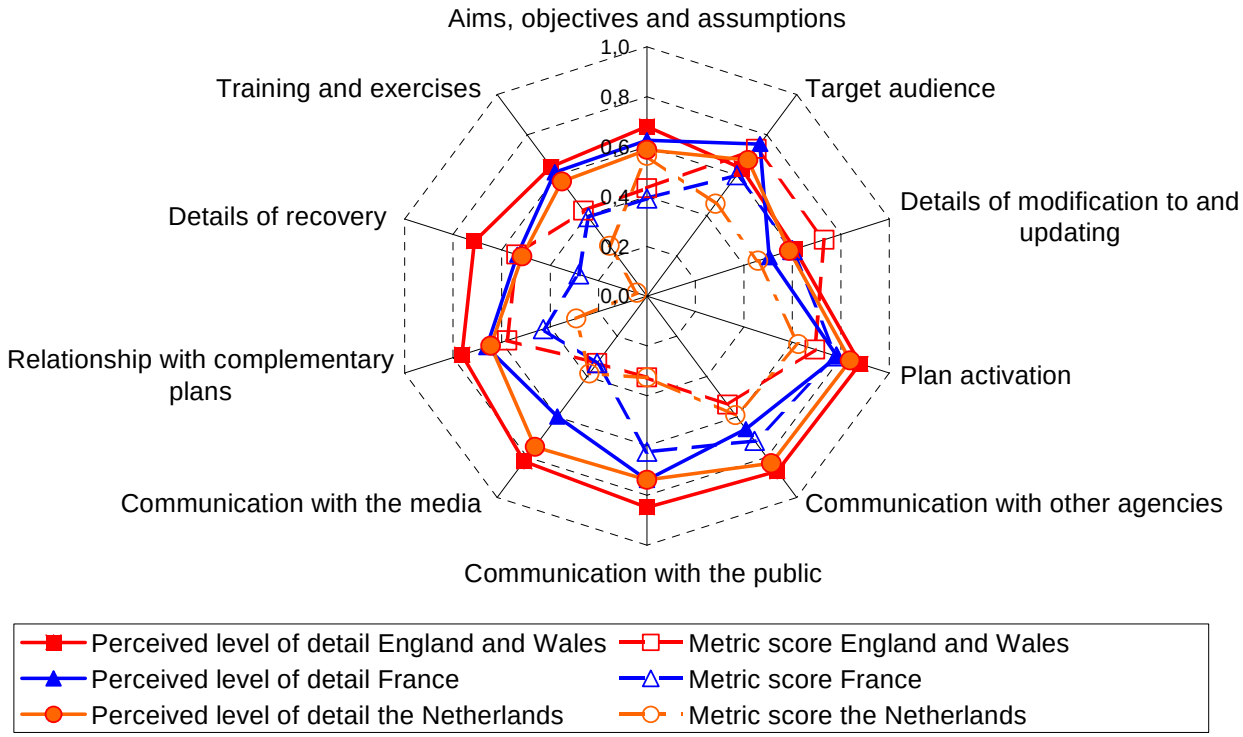


Figure 5.5 **Comparison of the normalised scores related to communication and organisation for the required detail of information as perceived by the stakeholders and the metric scores for England and Wales, France and the Netherlands**

6 Effectiveness of emergency plans for floods according to stakeholders

6.1 Survey results

As part of the survey the responders were asked to briefly list up to five criteria that they believed make an emergency management plan effective. The full list of answers to this question is given in Appendices G, H and I. A summary for each country is given below.

6.1.1 England and Wales

The criteria given by the responders can be grouped under the following headings in terms of the number of comments received:

1. Roles and responsibilities
2. Triggers levels
3. Flood mapping
4. Clarity and brevity of the plan
5. Relationship of the MAFP with other plans
6. Partnership approach in the production of the plans
7. Communication
8. Critical infrastructure
9. Training in the use of the plan
10. Other comments

These are discussed briefly below.

1. Roles and responsibilities

Some 24 comments were made stating that for an MAFP to be effective it had to have clear definition of agency roles and responsibilities and links to related plans. The "actions, roles and responsibilities" metric was found to be one of the higher scoring metrics. This would indicate that this is currently relatively well covered by MAFPs. Most of the MAFPs reviewed had details of the roles and responsibilities in a flood emergency. Many MAFPs had separate appendices for each actor in an emergency detailing their roles at different points in the flood. One responder summed up that an effective MAFP needed to have "*Roles and responsibilities clearly spelt out and agreed (with no assumptions made by any organisation)*".

2. Triggers or trigger levels

The second most popular answer in terms of what makes an MAFP effective was related to trigger levels. A trigger level can be defined as "an action causing the automatic invocation of a procedure". Many responders stated that for an MAFP to be effective clear triggers were needed to invoke actions and responses. There seemed to be a broad consensus that there needs to be clear definitions and guidance on how the MAFP is activated. In terms of the review carried out by the MAFPs the plan activation metric was found to be the third highest scoring metric indicating that the MAFPs that were reviewed covered this important aspect of emergency planning.

3. Flood mapping

There were of the order of 20 comments that related the effectiveness of an MAFP to provide flood maps. Many responders stated that the maps needed to have the following qualities:

- Up to date
- Be detailed
- Be available to all the agencies involved.

Feedback from the use of the MAFP during the recent floods in Cumbria indicated that flood mapping could be improved by:

- The inclusion of larger maps or maps showing more detail;
- The addition of maps of some areas highlighted as "hotspots" or which have a high flood risk and flooding history;
- The inclusion of the flood maps on an integrated GIS system.

The flood hazard mapping metric for the MAFPs reviewed in England and Wales had an average rating of "room for improvement". Many responders stated that flood maps showing maximum velocities and depths would be useful. These should now be available for the areas covered by many Local Resilience Forums as in more densely populated parts of the country the Environment Agency has often carried out two dimensional hydraulic modelling that can produce such maps.

4. Clarity and brevity of the plan

Many responders to the survey stated that for an MAFP to be effective it needed to have clear unambiguous wording and not be too long. One responder stated: "*A simple plan without great detail, signposting where further information is rather than including it in the plan to make it a bulky, dust gathering, document*." However, it is interesting to note that the MAFP for Cumbria that stretches to 300 pages was found to be "*compact and information in it was relatively easy to locate*" following its use in the recent floods in November 2009. It is also a plan that rated as being "above average" when the metrics were applied to it.

5. Relationship of the MAFP with other plans

For an MAFP to be effective 14 responders to the questionnaire stated that it needs to reference other relevant plans (e.g. evacuation, rest centre, recovery plans). An MAFP should also not duplicate information that appears in other plans. One responder stated "*if we need to wade through many different templates to get a picture of all the places that flood and the consequences, it will be hard to formulate a co-ordinated and prioritised response*." There should also be a difference between emergency flood plan and flood guidance. Sometimes the two appear to be mixed together which one responder stated "*makes a plan unusable in a crisis*". It is interesting to note that of the MAFPs reviewed the metric relating to the relationship of MAFPs with other plans was one of the higher scoring ones.

6. Partnership approach in the production of plans

Many responders to the questionnaire stated that for an MAFP to be relevant then there need to be a partnership approach to the formulation of the plan and that there should be "*engagement through Local Resilience Forums to truly reflect and seek engagement from all stakeholders*" when the plan is being put together.

7. Communication

Around ten responders stated that for a MAFP to be effective there needed to be clear lines of communication detailed within the plan.

8. Critical infrastructure

Recent flooding in England and Wales has highlighted the vulnerability of water, gas, communication and electricity supply infrastructure, collectively known as critical infrastructure. A similar sentiment was

expressed by many responders that it is important to identify critical infrastructure within floodplains and to have an understanding of the effect of what would happen if any of this infrastructure becomes inundated.

9. Training in the use of the plan

Nine responders stated that for an MAFP to be effective it needed to be used in a training exercise with the various actors involved and then "lessons learnt" following the training, exercise or a real flood incident needed to be incorporated in the plan.

10. Other comments

There were a range of other disparate comments relating to what makes an MAFP effective. These are summarised in Appendix H.

As part of the survey the responders were also asked if they had any further comments that they may wish to make about tools, methods or guidance that you believe could contribute to improving Multi Agency Flood Plans. These comments are provided in Appendix H.

6.1.2 France

The criteria given by the responders can be grouped under the following headings in terms of the number of comments received:

1. Communication and relationship between the different actors responsible for emergency planning
2. Knowledge of hazards and risks
3. Knowledge of processes and capabilities
4. Simple and adaptable
5. Exercises, updating and feedback
6. Information and communication
7. Assumptions and competencies

1. Communication and relationship between the different actors responsible for emergency planning

The first condition to ensure the effectiveness of an emergency plan is that the plan must be known and effectively shared and disseminated with all the actors. Some 30 responders to the French survey pointed out the necessity to maintain relationships with stakeholders and actors during the management of an emergency to make a plan effective. Responders also felt that the relevant authorities must be involved and informed in the production and the implementation of the plan. The effectiveness of plan could also be ensured by the compatibility of tools and data used by different actors.

2. Knowledge of hazards and risks

Responders indicated that they needed accurate information of the flood hazards and also on the elements at risk. There were a number of responses concerning the knowledge of receptors such as to people, properties and infrastructure at risk from flooding. Mapping and GIS were considered as important elements in making an emergency plan effective. Mention was also made of the need for trigger levels for areas that are not monitored by standard gauge points and flood maps showing the extent of flooding for different gauge levels.

3. Knowledge of processes and capabilities

The knowledge of process of plan activation (trigger levels, alert to people, rescue) is an important issue in the effectiveness. The information and processes must be standardized and known by all the actors. The language used in the plan must be understood by all the stakeholders and actors involved in the plan. It is also important to estimate the resources available to face up the crisis. It is also necessary to assess and to foresee the possibility of a crisis management organisation failure.

4. Simple and adaptable

Some 18 responders wrote the word “simple” as an element to qualify the effectiveness of a plan. Others words come out such as “readable, clear, legibility”. A weighty and complicated plan is not easy to learn for emergency planners and difficult to implement. “*Too much information kills information!*” was written by one responder.

The adaptability of the plan was mentioned by responders. Responders stated that this may be ensured by having several scenarios in order to have a progressive response to the emergency. The emergency plan must not only rely upon one scenario, which is often a scenario based on a rare event. The plan must not be too rigid and must be able to be adapted to unforeseen situations and “domino effect” (e.g. other hazards triggered by floods).

5. Exercises, updating and feedback

Exercises are mentioned to be a condition of the effectiveness of plans. Those exercises and trainings have to associate all the stakeholders and actors and if possible must involve authorities and policy-makers. Three responders estimate that historical information must be addressed in the plan. Feedback analysis for the updating of the plan was also quoted by around ten responders.

6. Information and communication

The communication of internal information was said to be a major factor in the effectiveness of the plan: communication between stakeholders.

7. Assumptions and competencies

For an emergency plan to be effective there needs to be a clear definition of its assumptions and a clear definition of the competencies required from each actor during the emergency.

6.1.3 The Netherlands

In the Netherlands when the stakeholders were consulted on what made an emergency plan effective the following answers were given. These were ranked as follows:

1. Organisation, command, responsibility
2. Information/knowledge
3. Readability and accessibility
4. Training
5. Decision making
6. Other aspects

1. Organisation, command, responsibility

Within the Netherlands, a well defined organisation and responsibility structure was seen to be of great importance. Elements mentioned by stakeholders included communication between parties, a clear command, “upscaling” of responsibilities when an event increases and clear defined roles and responsibilities.

2. Information/knowledge

The availability of information was mentioned by several responders including:

- Information on the flooding characteristics such as inundation (i.e. velocity, water depth, flow velocities), reliable predictions, insight into chain effects, scenarios;
- Information on evacuation and shelters;
- Possible measures;
- Area specific information.

The availability of the information during an event was also mentioned by the responders. In the Netherlands a system and work process has been set up ("Netcentric working") to improve the availability of information and communication between partners during an event.

3. Readability and accessibility
The accessibility, simplicity, clarity of a plan was mentioned as an important factor. During an event one should be able to read a plan quickly and find important items easily. In addition it was mentioned that a plan should be 'kept in a logical place'.

4. Training
Training, exercise and education were mentioned several times. This aspect is related to the previous point. The accessible of a plan is improved if more people are familiar with the plan. In addition training results in identifying weaknesses in the plan and process, makes it possible for the different parties to get familiar with each other's work process and gives an opportunity to get used to software tools used during an event.

5. Decision making
During an event several decisions need to be made. For example when does an event require a higher level of responsibility/administrative level, or the decision to execute a preliminary evacuation. Two responders mentioned these aspects of the criteria and information on which decision making is based.

6. Other aspects
Other aspects mentioned were the date of the plan, communication to the public, the relation with other plans and implementation by the involved organisations.

6.2 A summary of the face-to-face consultations with stakeholders

6.2.1 England and Wales

From the discussions we have had with stakeholders responsible for producing Multi Agency Plans there is often a sense of a "responsibility and knowledge gap" between Local Authority emergency planners and Environment Agency staff. One responder to the survey summed this up by stating that:

"*The overall feeling is that the Environment Agency on a regional and local level could and should take a far stronger role as hands-on facilitators of this work. They have far more experience of producing flood plans and responding to flooding than Local Authorities and this knowledge based on lessons learnt is not being utilised. The support from the Environment Agency is lacking at a local level - as a Local Authority Emergency Planning Unit we cover a number of local authority areas, if we want to use GIS we have to either approach each separate council to produce mapping products resulting in non-standard maps being incorporated into the plan or somehow try and synchronise data from all authorities into an in house GIS which then results in issues around data licensing particularly for populations/number of residences etc. The Environment Agency is far better skilled and resourced to undertake this work.*"

There was a general consensus that in many cases a lot of duplicate information is contained within different emergency plans. Consultation meetings have suggested that a checklist of actions could be useful to include in an emergency plan. This would be used to record that generic actions had been taken. This could be more useful than specifying detailed responses to specific trigger levels, given the other information available in the plans. Some stakeholders also thought that an overview of how all of the organisations involved in the response to a flood emergency fit together would be of use. It was also stated that use of visualisation techniques (e.g. having access to digital and suitably sized paper copy maps) is important during a flood incident.

6.2.2 France

Interviews were held with emergency planners in southern France in the Gard and Herault Départéments. Emergency managers pointed out that there was room for improvement in their own capacity to analyse the ability of the organisation to operate efficiently for a sustained emergency. Emergency planners were also eager to assess the potential failure of internal and external emergency management organisation.

The interviews with emergency planners highlighted the role of practice and experience in the management of a crisis. Many emergency planners improve their knowledge through feedback from previous flood incidents. Emergency planners who recently managed a crisis are more confident in their knowledge of field and emergency situations. The PCS plans cover all emergencies. Unlike many other hazards floods can be forecast several hours or in some cases several days in advance. There is also a perception by responders and planners that floods can be handled by people with a lower degree of "technical competencies" unlike forest fires or technological hazards.

6.2.3 The Netherlands

For the project entitled the "National Evacuation Module (LEM)", interviews have been held with different parties involved in mass evacuation during a flooding event. The results of three questions, focusing on the effectiveness and bottlenecks of evacuation and event management planning, are of interest to the FIM FRAME project:

1. What makes an event plan effective? How does one check if a plan is effective?
2. What are the most important bottlenecks encountered with regards to process?
3. What are the most important bottlenecks encountered with regards to the content of the plans?

The following paragraphs give a summary of the results. Full results for these questions can be found in Appendix J.

Common sense and expertise
A flood and a mass evacuation are situations which very rarely occur in the Netherlands. Flood emergency plans are therefore hardly ever put to the test in real life. Several people therefore responded to the question 'What makes a plan effective' by noting that a plan is developed on expertise and use of common sense. One interviewed said: "*A plan is never completed. It is hard to tell if a plan is good.*" Another mentioned: "*The expertise of the plan developers is conclusive.*"

Framework and guidelines
There are no criteria available to judge the effectiveness of a plan. In the Netherlands there is a lack of a framework or guidelines for setting up a plan. On a regional level, it is indicated though that there is a need for guidelines to assist the regions with the development of plans. Currently the 'Ministry of Traffic and Water' are developing a framework for the review of plans which in future could be used for the phase of developing plans as well.

Training and exercise
The need for training in and exercising a plan was emphasised by different interviewees. Training and exercise results in organizations taking ownership of plans and results in identifying shortcomings in the plan and critical paths in the organization. In addition the feasibility and workability of a plan is tested during the exercise. As a requirement for a plan to be effective, one interviewed said "*a plan should be feasible, executable and embedded in the organization*."

Actions, roles and responsibilities
An aspect mentioned as an issue by many of those interviewed was the link between a national and regional level and the cooperation between regions. To be able to effectively deal with a large flood, the coordination between the national and the regional level will need to be improved. The large number of

parties involved which all seem to have an advisory role instead of a command and control role was also mentioned as an issue.

A flood event in the Netherlands could cover a large spatial scale and as a result several people interviewed felt that it is inevitable that certain aspects need to be coordinated on a national level. Examples given were the general coordination and the appointment of refuge locations. These aspects need to be planned for on a national level, but currently it is felt by those interviewed that the current plans are not sufficient to deal with such a large event.

Risk perception and communication, behaviour of the public
Currently there is a lot of attention and research on risk perception and communication. Several of those interviewed mentioned the subject. One person mentioned that "*the behaviour of people during an event should be taken into account when evaluating plans"*, while another said "*the behaviour of the people is the big unknown*." Risk and crisis communication and behaviour of the people nonetheless were seen to be constraints. There is little experience with mass evacuation and both the public and the relief services do not have a realistic image of a mass evacuation.

Elements within a plan
For a plan to be effective the following elements were mentioned as being essential in a plan:

- Clearly defined actions and checklists. Plans should lead to a checklist for policy makers and checklists and action maps for operations;
- It should be clear what a plan is based on and what instruments were used to make a plan;
- Aims, assumptions and starting points are made clear and explained (including error/uncertainty margin);
- Resources (mentioned by several interviewed). From the plan the requirements for number of people and resources can been made;
- When a range of scenarios has been considered.

In addition the following elements were mentioned to be constraints owing to a lack of knowledge or attention given to the subject:

- Care and shelter. How is care and shelter organized on a national level?
- Scenarios. Overview/insight of chosen assumptions on which the plan is based and reason why this choice was made. During an evacuation if it is seen that the situations differs from the assumed situation for the plan, one can choose to change the plan.
- Traffic management. Traffic management is seen as an important issue covering different aspects such as the availability and overview of situation on the roads, the capacity of the exits of an area, capacity and availability of the infrastructure, organization of incoming and outgoing traffic and knowledge on use of public transport during an event.

6.3 Discussion on effectiveness of plans

According to the responders from the three countries a well defined description of the roles, responsibilities and communication between the parties is essential for a plan to be effective. This criterion is followed by criteria on the availability of knowledge and information. The criteria 'clarity, accessibility and 'simpleness' of the plan' were also mentioned in the three countries, as well as training and exercise. The familiarity with a plan is improved if trained. In addition training results in identifying weaknesses in the plan and process. Other specified criteria differ for the three countries.

7 Conclusions

There is often a lack of homogeneity between the emergency plans that have been reviewed. Although to a certain extent this is to be expected given the different nature of the flood risk in the areas covered by the plans that were reviewed. However, the same information for example was often expressed in significantly different levels of detail. For example in England and Wales, two MAFPs did not include flood hazard maps and did not state if these were readily available either in other plans or other forms (e.g. CD ROM or a secure web site). In the Netherlands many of the flood maps included in emergency management plans had details of maximum velocities. There is also a room for improvement in many plans in the production and the use of such maps. What sort of maps can be used to prepare the crisis management? Is GIS really useful and effective during the emergency? Is it easier to use hard copy during an emergency rather than a GIS especially at local level? It is also interseting to note the differences in the availability of the maps in the three countries. An improvement can be made in publishing maps that are easily readable for the target audience.

Many of the plans reviewed had what could be classed as a large amount of generic “cut and paste” text on flooding but had limited text on local or regionally specific issues. It would appear from the research that many of the responders would like more specific information especially with regards to the nature of the flood hazard and the accessibility of roads to emergency services and other vehicles for different flooding scenarios. In many densely populated areas it would be relatively easy to develop such maps for different probabilities of flood events.

In England and Wales there was a distinct correlation between the length of the plan and its “quality”, as measured by the metrics that have been developed by the research. This was also the case, to a lesser extent, in the Netherlands. However, in France there was almost no correlation between the length of an emergency plan and its metric score. It is interesting to note that many of the stakeholders consulted as part of this research stated that in order for a plan to be effective it should be “*concise*” or “*short*”. The MAFP for Cumbria in England that was put into action during severe flooding in November 2009 is some 300 pages in length. This was one of the longest of the plans that was reviewed. However, feedback from the stakeholders who used it during this emergency was that “*the plan was found to be compact and information in it was relatively easy to locate*”.

Figure 7.1 shows a comparison of the metric scores for the three countries for the emergency plans that have been reviewed. Metrics related to organisational aspects of the plan such as: plan activation; roles and responsibilities; communication with other agencies; and target audience and updating scored well in all three countries. The assumptions made by the plan do not appear to be well defined in all three countries.

Details of previous floods although covered reasonably well in England and Wales and France are not covered well in the Netherlands; this may be as a result of there having been no major flood events in the Netherlands since 1953. Although it is interesting to note that the 1953 flood does not seem to be referenced in Dutch plans.

Metrics related to the possible impacts of floods on receptors such as businesses; critical infrastructure; people; vulnerable people and NaTechs all score well below average in all three countries. Overall, the plans for England and Wales showed the greatest differentiation between the scores for ‘organisation and responsibilities’ and for ‘impact on receptors’.

Figure 7.2 shows the normalised metric scores for five metrics compared with the normalised usefulness of the information as perceived by the stakeholders who answered the online survey. The perceived

"usefulness" of information on: loss of life; damage to critical infrastructure; other hazards resulting from floods; evacuation routes; and shelters is similar in both England and Wales and France. The mean metric scores shown in Figure 7.2 for the two countries are relatively low indicating that there is a discrepancy between what the stakeholders perceive to be useful and the information that is actually provided in emergency plans.

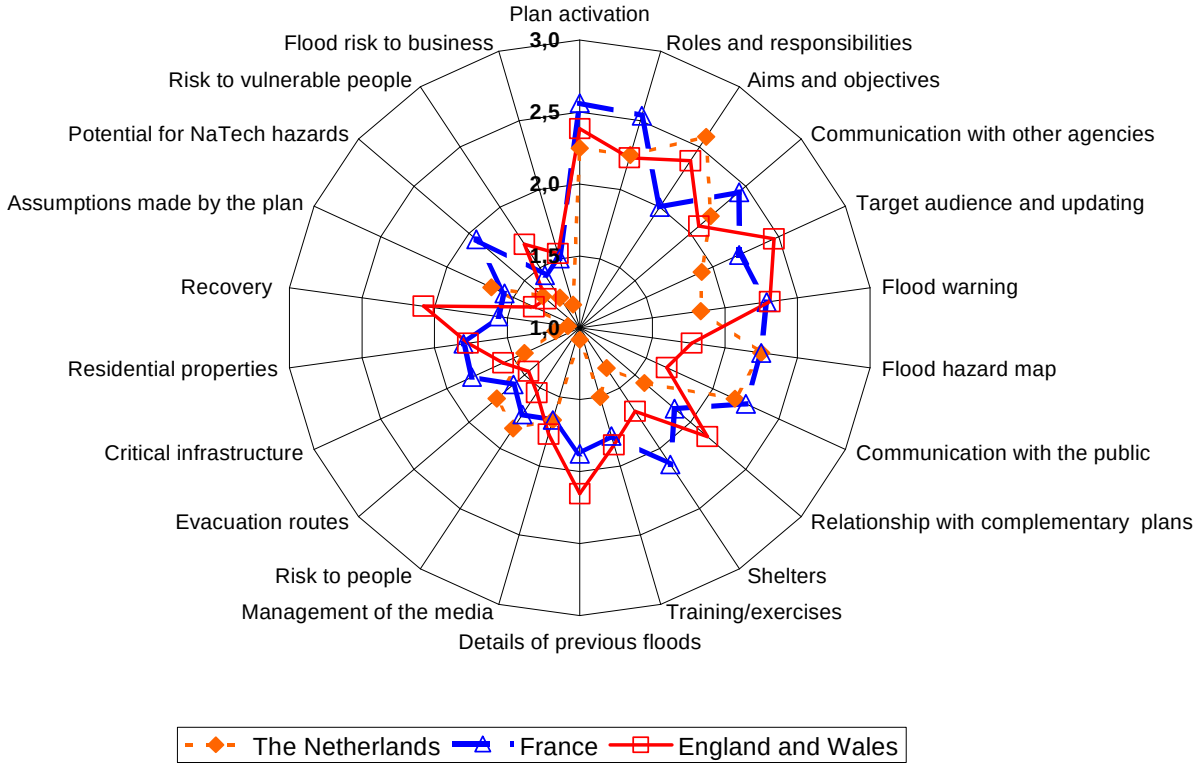


Figure 7.1 Comparison between mean metric scores for emergency plans in England and Wales, France and the Netherlands'

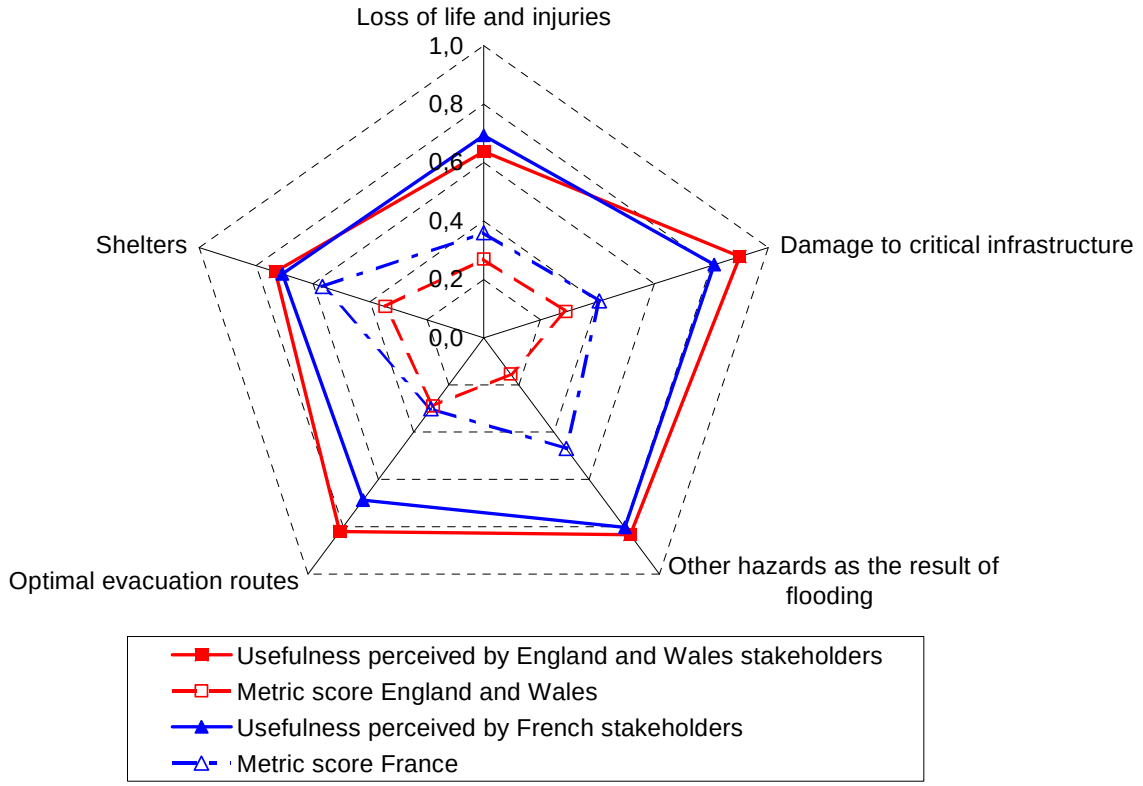


Figure 7.2 Comparison of the normalised scores for the usefulness of information as perceived by the stakeholders and the metric scores for England and Wales and France

Figure 7.3 shows the normalised metric scores for seven metrics compared with the normalised level of detail required in a plan as perceived by the stakeholders who answered the survey. The perceived "level of detail" of information on: flood risk to people; flood risk to property; critical infrastructure; evacuation; NaTechs; shelters; and flood maps is similar in all three countries. Again, the mean metric scores shown in Figure 7.3 for the three countries are low indicating that there is a discrepancy between the stakeholders' perceived level of detail required and the information that is actually provided in emergency plans.

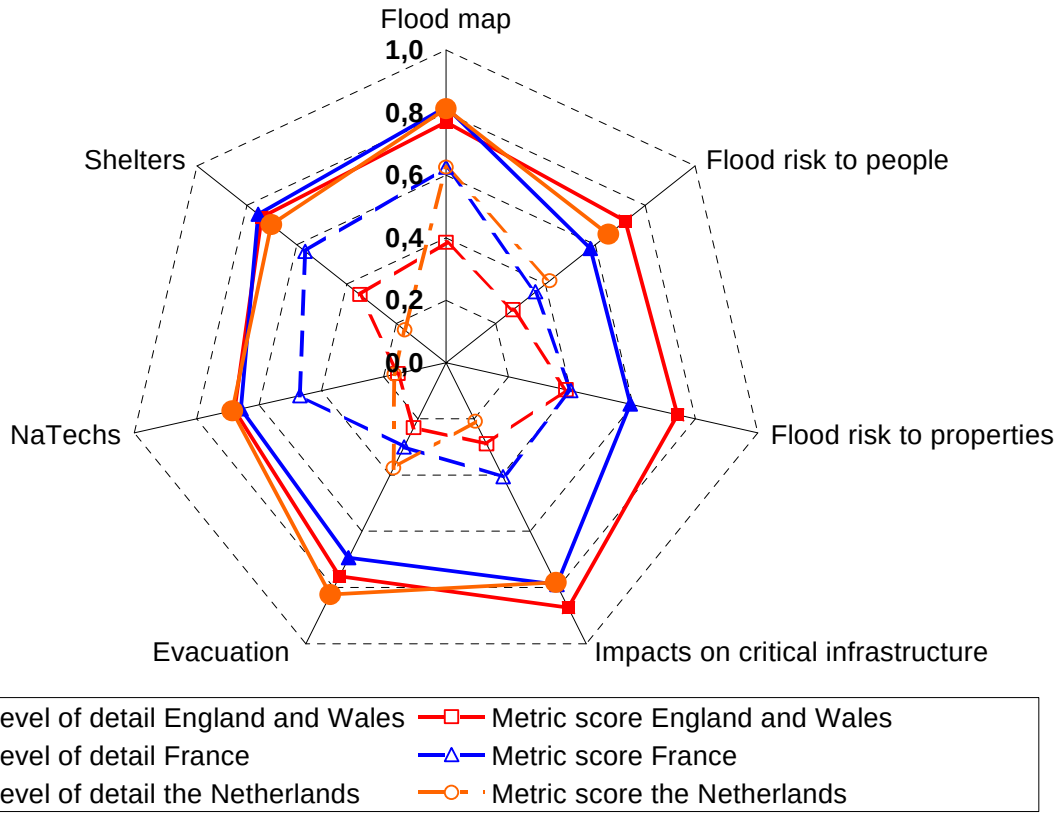


Figure 7.3 Comparison of the normalised scores related to receptors for the required detail of information as perceived by the stakeholders and the metric scores for England and Wales, France and the Netherlands

Figure 7.4 shows the normalised metric scores for seven further metrics compared with the normalised level of detail required in a plan as perceived by the stakeholders who answered the survey. The perceived "level of detail" of information on issues related to communication and organisational aspects of the plans are similar in all three countries. The mean metric scores shown in Figure 7.4 for the three countries are much closer to the perceived level of detail required by the stakeholders than the metrics shown in Figure 7.3 related to risk to the receptors. There are some exceptions including communication with the media; details of recovery in France and the Netherlands. However, in general these aspects are covered in more detail.

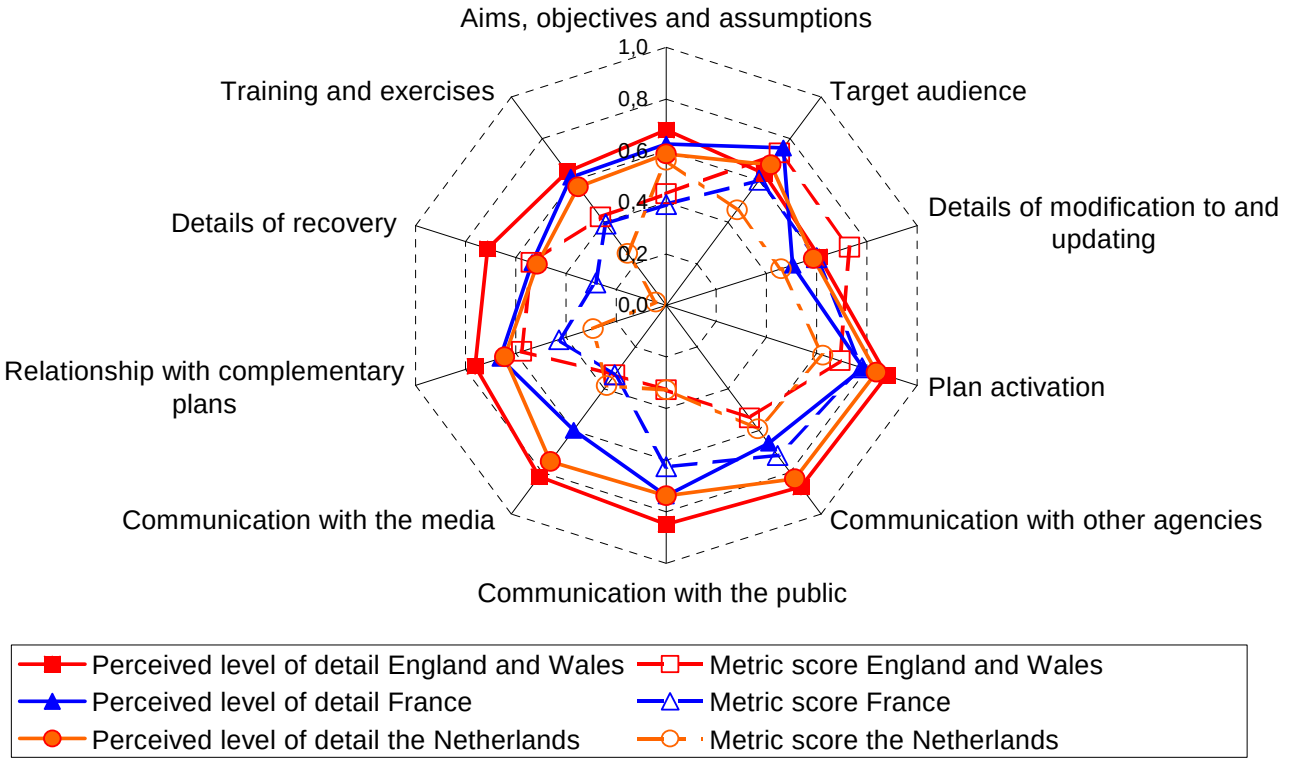


Figure 7.4 **Comparison of the normalised scores related to communication and organisation for the required detail of information as perceived by the stakeholders and the metric scores for England and Wales, France and the Netherlands**

The metrics developed as part of the research have proved to be a useful tool for assessing emergency plans, for identifying strong points and weaknesses, as well as providing a basis for comparison of the plans. There will always be some "subjectiveness" involved when applying the metrics, however, the metrics in the context of this research provide a basis to map the following:

- Where improvements can be made in the plans
- Requirements of the stakeholders
- Use and availability of tools that can be used to improve plans and meet the requirements of emergency planners and responders.

The following conclusions can be made from the research carried out:

(i) Metrics related to implementation of plans and organisation tend to be high in all three countries

In England and Wales, France and the Netherlands metrics such as "plan activation"; "actions, roles and responsibilities", "flood warning" and "target audience and updating"; and "aims and objectives" all score well. In England and Wales many stakeholders who took part in the research stated that it was important to have roles and responsibilities well defined in flood emergency plans for different levels of flooding. The scores of these metrics would indicate that in general emergency planners are covering these subjects well.

(ii) Flood hazard maps

The metrics would appear to indicate that there is a difference in the way that flood hazard is depicted in emergency plans between England and Wales, France and the Netherlands. In France and the Netherlands the metric score for flood hazard maps were both in the "above average" range. This is likely to be because in France and the Netherlands the flood maps included in the plans often include the maximum flood depth and sometimes maximum flood velocity. In England and Wales only the maximum flood extent is generally shown.

The type of flood hazard maps available was also mentioned by the stakeholders engaged by the research team. Many stated that maps showing maximum depths and velocities for different flood scenarios would be useful to them if they could be made available. In England and Wales it should be possible to produce such maps in areas where two dimensional hydraulic modelling has been carried out. Similarly in France there was a stated desire to have more detailed flood maps in terms of the mapped hazard.

(iii) Risks to people

In terms of metric scores the Netherlands had the highest score on risk to people. This may be partly as a result of the fact that researchers in the Netherlands have pioneered methods to assess injuries and loss of life due to flooding and that a sudden failure of flood defences could result in a large number of fatalities. In France and England and Wales there was "room for improvement" in the treatment of risk to people, particularly vulnerable groups.

(iv) Critical infrastructure

In all three countries there appeared to be a lack of information in plans on critical infrastructure with this metric having an average score of 1.15, 1.8 and 1.6 in England and Wales, France and the Netherlands respectively. With regards to critical infrastructure it was clear from the research undertaken with the stakeholders in England that they saw "potential damage to critical infrastructure" and the "interdependence between at risk critical infrastructure" (e.g. the failure of an electrical substation affecting a water treatment works) as being important to include in Multi Agency Flood Plans. However, this information was often not readily available to emergency planners.

(v) NaTech hazards

In England and Wales there was only one plan that showed the location of industrial facilities in the floodplain. In France the metric for NaTech hazard scored higher than for the Netherlands and England and Wales; this is likely to be because the PCS plans in France have a legal requirement to cover technological hazards.

(vi) Accessibility of roads

In France and England and Wales there was great emphasis given by the stakeholders on the accessibility of roads. The feedback on the emergency plan that was used recently in the Cumbrian floods was that maps showing potential road inundation outside the "formal Environment Agency Flood Map" were of great use to emergency responders. In some regions of France methods are being developed specifically to assess the inundation of roads to assist emergency planners with their response.

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Appendix A Details of the review of Multi-Agency Floodplains in England and Wales

Introduction

Flood emergency plans are dynamic documents that are often being updated. It is therefore important to note that many Local Resilience Forums are still in the process of producing MAFPs and this together with issues of confidentiality in some cases, limited the number of MAFPs that were readily available to review.

It is important to note that when the metrics were applied to assessing flood emergency plans if an item was not included but the reason for its lack of inclusion was fully justified then the particular metric was assessed as being of medium level of detail.

It is important to note that some of these metrics (e.g. evacuation routes) might be included in complementary plans. However, if they are included in these complementary plans it is often not explicitly stated in the MAFPs that this is the case.

Table A1 List of flood emergency plans reviewed for England and Wales

Name of plan	Date of plan	Length of plan (pages)	Average score
Cornwall Emergency Plan	January 2004	Approximately 150	2
Devon Emergency Plan	April 2004	Approximately 250	2.2
Hampshire Flood Response Plan	December 2007 Version 1	28	1.3
Suffolk Multi Agency Flood Plan	March 2009 Issue 2	43	1.5
Walsall Flood Plan	January 2009 Amendment 01/09	24	1.5
Coventry Multi-Agency Flood Plan	Draft 31 March 2009	46	1.8
North Wales Multi-Agency Flood Plan	Version 3 May 2009	227	2.2
Northumberland Local Resilience Forum Multi Agency Flood Plan	Consultation Draft Version 1.0 September 2009	209	2.3
Cumbria Multi-Agency Flood Plan	October 2009	300	2.2
Doncaster Multi-Agency Flood Plan	Version 5 October 2009	117	2.3
Multi-Agency Flood Response Coordination Plan - Ryedale	November 2007 Reviewed: October 2009	120	1.9
Hertfordshire Multi-Agency Strategic Flood Plan	Version 1.6 November 2009	21	1.3
Avon and Somerset	Version 1.9 December 2009	58	2
Average score			*1.9*

Review of Doncaster Multi Agency Flood Plan (MAFP)

Doncaster is a large town in South Yorkshire in the north of England, and the principal settlement of the Metropolitan Borough of Doncaster. According to the 2001 census, the urban sub-area of Doncaster had a population of approximately 68,000 together with Bentley and Armthorpe it forms an urban area with a population of about 128,000. Doncaster is located inland and is not at threat from coastal floods. Version 5 of the Draft Doncaster MAFP was produced in October 2009 and stretches to 117 pages. The Doncaster MAFP is a well put together comprehensive plan. Although it does not include any flood maps it clearly states that the maps have deliberately not been included in the MAFP owing to their size and volume. The plan also clearly states that the maps are readily available to the relevant stakeholders in electronic (GIS format) and hard copy. Table A1 provides a brief review of the Doncaster MAFP using the metrics developed as part of FIM FRAME the plan was found to be "Above average".

A2 Review of version 5 of the Draft Doncaster Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods			●	3
Flood hazard map		●		2
Flood Warning			●	3
Risk to people	●			1
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business	●			1
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards	●			1
Evacuation routes		●		2
Shelters/Safe havens		●		2
Relationship with complementary emergency plans			●	3
Communication with other agencies			●	3
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan			●	3
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery		●		2
Training and exercises		●		2
			Average score	2.3
			Rating	"Above average"

Review of Northumberland Local Resilience Forum Multi Agency Flood Plan

Northumberland is located in the north-east of England. It borders Cumbria to the west, County Durham to the south and Tyne and Wear to the south east, as well as having a border with Scotland to the north, and the North Sea to the east. Its location in England is shown in Figure A1. In 2008 Northumberland had an estimated population of some 311,000 people. It is clearly stated in the plan that "*this plan only provides a response to the threat of fluvial and coastal flooding within Northumberland. It is our intention to develop the Action Plan further by detailing a response to surface water flooding, during the December 2010*

review." The Northumberland Multi Agency Flood Plan (MAFP) is a well put together comprehensive plan. The review of the plan is summarised in Table A2.

The plan has very few areas which could be classified as needing "room for improvement". The two areas where this was found to be the case was in the assumptions made by the plan which do not seem to be clearly stated anywhere and the possibility of NaTech hazards occurring as the result of flooding. Using the metrics developed the Northumberland MAFP was found to be "Above average".

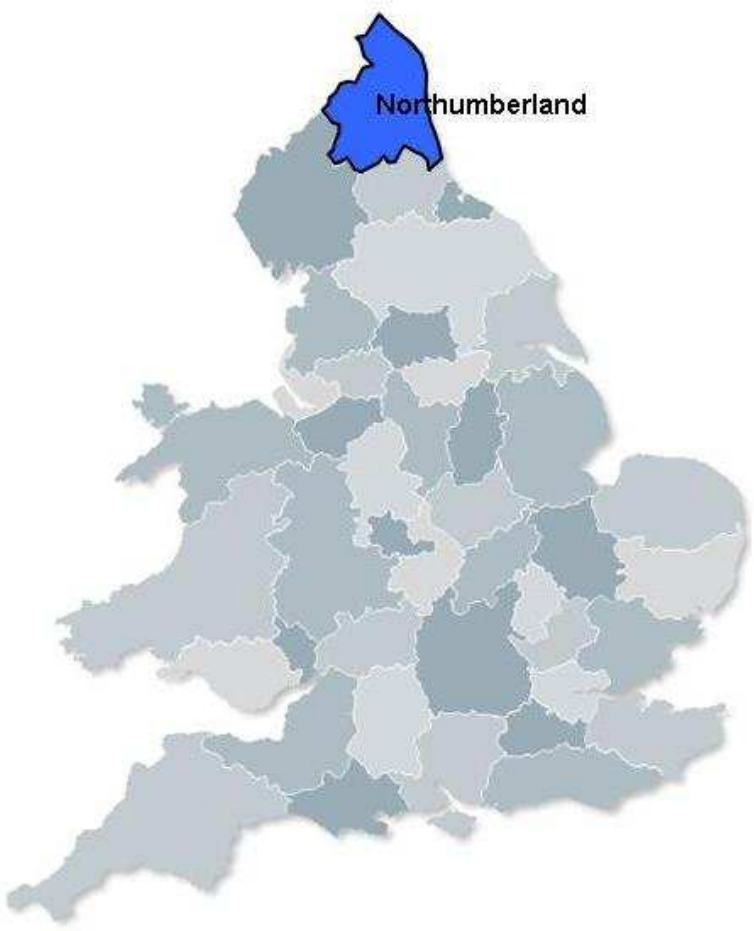


Figure A1 Location of Northumberland in England and Wales

Table A3 Review of Northumberland Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods		●		2
Flood hazard map		●		2
Flood Warning			●	3
Risk to people		●		2
Risk to vulnerable people			●	3
Flood risk to residential properties		●		2
Flood risk to business		●		2
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards	●			1
Evacuation routes		●		2
Shelters/Safe havens		●		2
Relationship with complementary emergency plans			●	3
Communication with other agencies			●	3
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan	●			1
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery			●	3
Training and exercises		●		2
			Average score	2.3
			Rating	"Above average"

Review of Ryedale Multi Agency Flood Response Co-ordination Plan

Ryedale is a non-metropolitan district of the county of North Yorkshire in northern England. In 2008 Ryedale was estimated to have a population of 53,800. The Ryedale area is not subject to flooding from the coast. Although the Ryedale Multi- Agency Flood Response Plan is a well put together plan it only rates as an "average" plan using the metrics this because there are a number of items including flood risk to people and buildings that are not detailed in the plan. A summary of the review of the Ryedale plan is given in Figure A2.

Table A4 Review of Ryedale Multi-Agency Flood Response Co-ordination Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods			●	3
Flood hazard map		●		2
Flood Warning			●	3
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties		●		2
Flood risk to business	●			1
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens		●		2
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public	●			1
Management of the media		●		2
Assumptions made by the plan	●			1
Plan activation			●	3
Actions, roles and responsibilities			●	1
Recovery		●		2
Training and exercises		●		2
			Average score	1.9
			Rating	"Average"

Review of Coventry Multi Agency Flood Plan

Coventry is a city and metropolitan borough in the county of West Midlands in the centre of England. Coventry is the ninth largest city in England and as of 2008 had an estimated population of 309,800. The area covered by Coventry City Council's boundary has not historically been subject to significant flooding. However, Environment Agency maps have disclosed areas of risk. Although most of Coventry is not a significant risk from fluvial flooding this MAFP would have benefited from the inclusion of flood maps or at least a reference to the flood maps that have been produced as part of the Strategic Flood Risk Assessment. There is room for improvement in the Coventry plan especially with respect to giving more details of the type and location of the receptors that are at risk from flooding. This information should be readily available. The review of the Coventry Plan is given in Table A3.

Table A5 Review of Coventry Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods			●	3
Flood hazard map	●			1
Flood Warning		●		2
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans	●			1.5
Communication with other agencies	●			1
Communication with the public	●			1.5
Management of the media	●			1.5
Assumptions made by the plan	●			1
Plan activation			●	3
Actions, roles and responsibilities		●		2
Recovery		●		2
Training and exercises	●			1
			Average score	1.8
			Rating	"Room for improvement"

Review of Suffolk Multi Agency Flood Plan

Suffolk is a non-metropolitan county in the east England. It has borders with Norfolk to the north, Cambridgeshire to the west and Essex to the south. The North Sea lies to the east. The county town is Ipswich. The county is low-lying with few hills, and has in the past (e.g. 1953) been subject to serious coastal flooding. Suffolk had an estimated population of about 716,000 in 2008. The location of Suffolk in England is shown in Figure A2. The Suffolk Multi-Agency Flood Plan was produced in March 2009. The summary of the metrics is given in Table A4. The plan contains a considerable amount of generic text and would benefit from being more specific. The flood mapping presented is fairly limited but this may be because there is more detailed mapping at a more localised level covered by other plans. The plan would benefit from employing the document "Developing a Multi-Agency Flood Plan". Similar to the Coventry plan there is a lot of useful information concerning receptors and there exposure to the flood hazard that could be added.

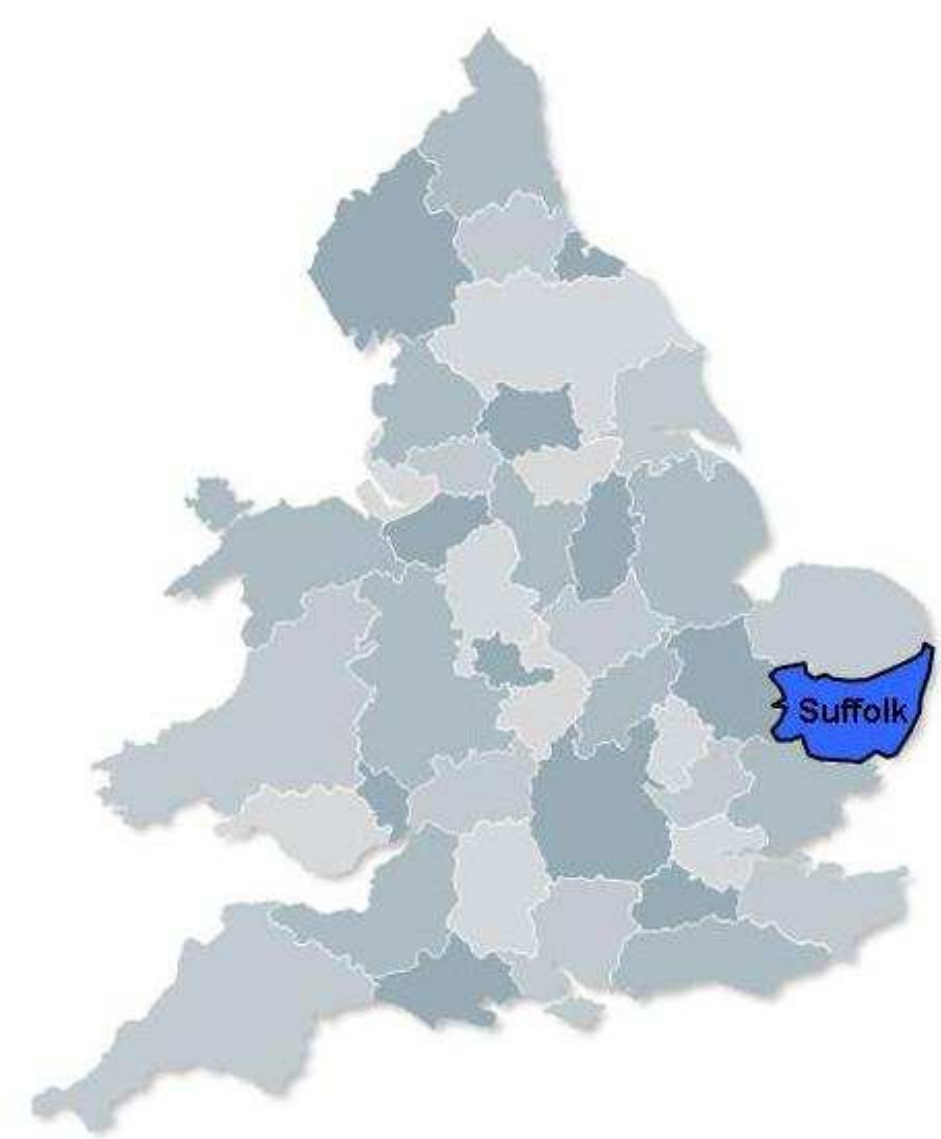


Figure A2 Location of Suffolk in England and Wales

Table A6 Review of Suffolk Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods			●	3
Flood hazard map		●		2
Flood Warning		●		2
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans	●			1
Communication with other agencies		●		2
Communication with the public	●			1
Management of the media	●			1
Assumptions made by the plan	●			1
Plan activation	●			1
Actions, roles and responsibilities		●		2
Recovery		●		2
Training and exercises		●		2
			Average score	1.5
			Rating	"Room for improvement"

Review of Hertfordshire Multi Agency Flood Plan

Hertfordshire is located immediately to the north of Greater London. The location of Hertfordshire is shown in Figure A3. The 2001 census indicated that Hertfordshire has a population of some 1,034,000 people. There is no threat of coastal flooding in the county. Version 1.6 of the Hertfordshire Multi-Agency Flood Plan (MAFP) was produced in November 2009. The plan is 21 pages in length and is fairly brief in its details. This may be because flooding is not seen as a major issue in Hertfordshire. Table A5 provides details of the review of the Hertfordshire MAFP using the FIM FRAME developed metrics. The metrics indicate that there is "Considerable room for improvement" in the plan. The details of many of the key issues in the plan are fairly limited. There is room for considerable improvement in the plan. One way in which the plan could be improved is by the addition of additional maps and figures at a suitable scale. It may be that these figures exist in a digital format (e.g. GIS) or are presented in other complementary plans. However, if these are available it is not stated in the plan. The plan could also benefit from following the "templates" and "models" that are detailed in the document called "Developing a Multi-Agency Flood Plan" produced by Defra/Environment Agency in 2008.

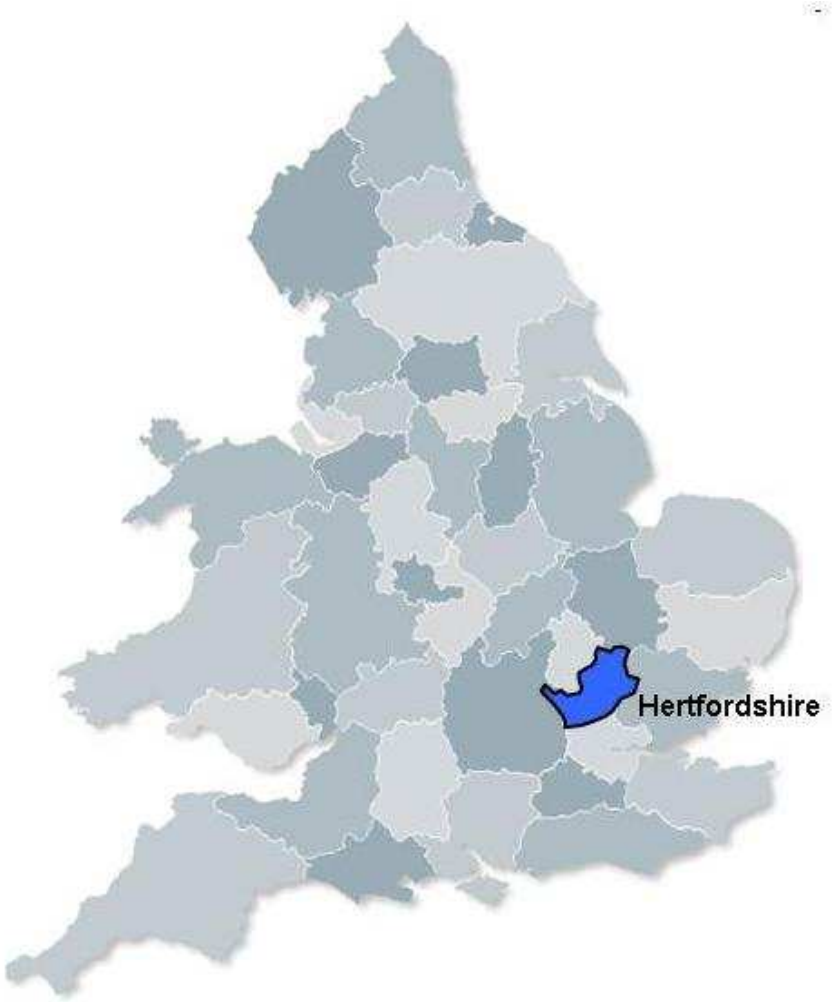


Figure A3 Location of Hertfordshire in England and Wales

Table A7 Review of Hertfordshire Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map		●		2
Flood Warning	●			1
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties		●		2
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1.5
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public	●			1
Management of the media	●			1
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities	●			1
Recovery	●			1
Training and exercises	●	●		1
			Average score	1.3
			Rating	"Considerable room for improvement"

Review of Cumbria Multi Agency Flood Plan

Cumbria is a non-metropolitan county in the north west of England. The county consists of six districts, and in 2007 had a total population of 498,800. The county is bounded to the west by the Irish Sea. It is a predominantly rural county; Cumbria is much of the county is mountainous. All the mountains in England that are over 900 m above sea level are in Cumbria. In November 2009 it was subject to a series of flash floods. The location of Cumbria in England is shown in Figure A4. The key sources of flooding in order of risk are stated by the plan to be:

- Localised surface water i.e. road drainage/Sewer flooding;
- Main river/Ordinary watercourses;
- Tidal;
- Canal related problems;
- Reservoir related problems.

The MAFP that covers Cumbria is a comprehensive document that stretches to 300 pages. The plan is well put together covering almost all the key issues apart from evacuation. Table A6 provides an overall

summary of the review of the plan which was found to be “above average” using the metrics that were developed.

Table A8 Review of Cumbria Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods			●	3
Flood hazard map		●		2
Flood Warning			●	3
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business		●		2
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards		●		2
Evacuation routes	●			1
Shelters/Safe havens		●		2
Relationship with complementary emergency plans			●	3
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media	●			1.5
Assumptions made by the plan	●			1
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery			●	3
Training and exercises		●		2
			Average score	2.2
			Rating	“Above average”

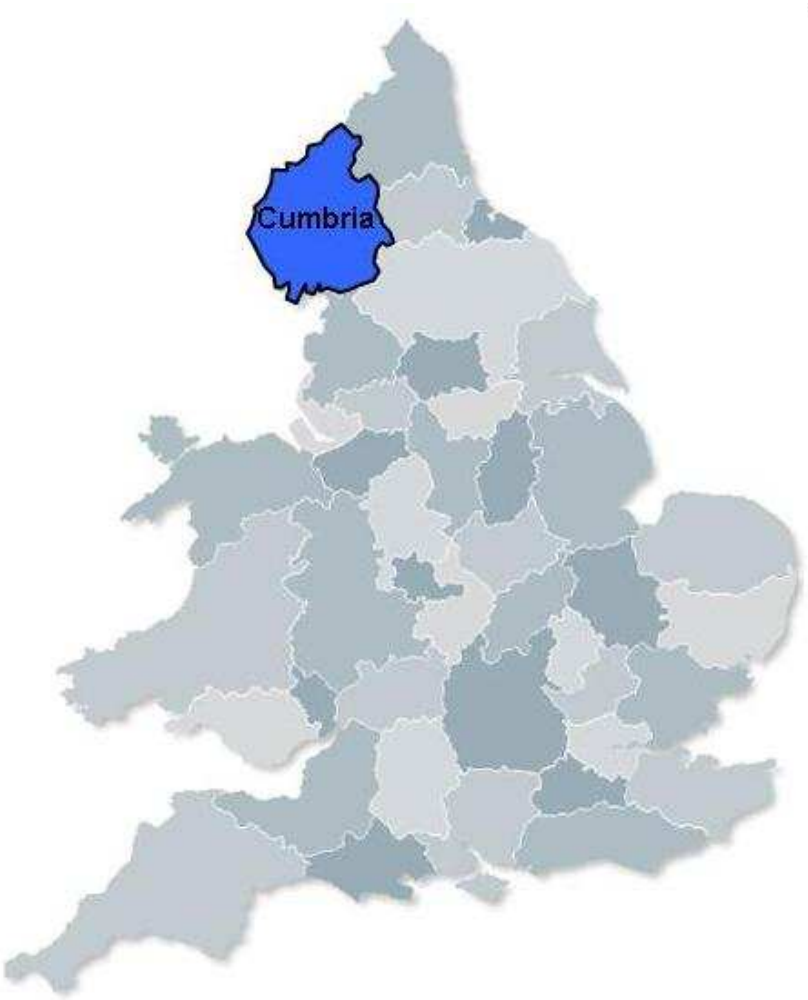


Figure A4 Location of Cumbria in England and Wales

The plan was put into practice in the recent November 2010 floods. Feedback on the plan during these floods can be summarised as follow:

Positive points

The following provides a summary of the positive points that were made about the plan after the flood:

i. 'The Risk of Flooding' was the most used section of the plan by responders and at 'Gold' Command. The information on the maps particularly the local infrastructure, location of substations, care homes was stated to be very useful.
ii. Splitting the information into District Council Sections was seen to be useful rather than just into catchments as was the separation of fluvial and tidal flooding.
iii. The inclusion of maps showing flooding "hot-spots" and roads liable to inundation outside the formal Environment Agency Flood Map.
iv. A good 'Actions Roles and Responsibilities' section together with resource forms.
v. The MAFP was seen to complement the Cumbria General Emergency Plan well with only limited duplication
vi. The plan was found to be compact and information in it was relatively easy to locate.

Negative points

The main negative point expressed was that the maps in the MAFP were not large enough and many responders felt it would be easier to annotate a suite of larger maps.

Room for improvement

Areas were it was felt that the MAFP could be improved included:

- Flood maps showing Flood Zones 2 and 3 beyond the Flood Warning;
- The inclusion of larger maps or maps showing more detail;
- The addition of maps of some areas highlighted as “hotspots” or which have a high flood risk and flooding history;
- The inclusion of the flood maps on an integrated GIS system;
- Provision of a link to reservoir inundation plan.

Review of Avon and Somerset Multi Agency Flood Plan

Avon and Somerset is located in the west of England, as shown in Figure A5 and has an estimated population of some 1.5 million people. Avon and Somerset is at risk from both coastal and fluvial flooding. The Avon and Somerset MAFP is a 58 page document. Version 1.9 of this plan was released in December 2009. This was one of the few plans reviewed where the assumptions in the plan are well set out and documented for generic, fluvial, tidal and pluvial flooding.

Table A7 provides a review of the Avon and Somerset MAFP. It ranks as an “average” MAFP. There are several positive aspects to it; however, there is a lot of generic text and mention of the use of Local Authority Flood Plans. The MAFP does not include any form of flood hazard map. Although these are likely to be included in Local Authority Flood Plan if widespread flooding were to take place in Avon and Somerset it would be useful if the MAFP also included maps. The MAFP would then act as a “repository” for maps and the overall flood hazard could be more easily assessed by the responders.

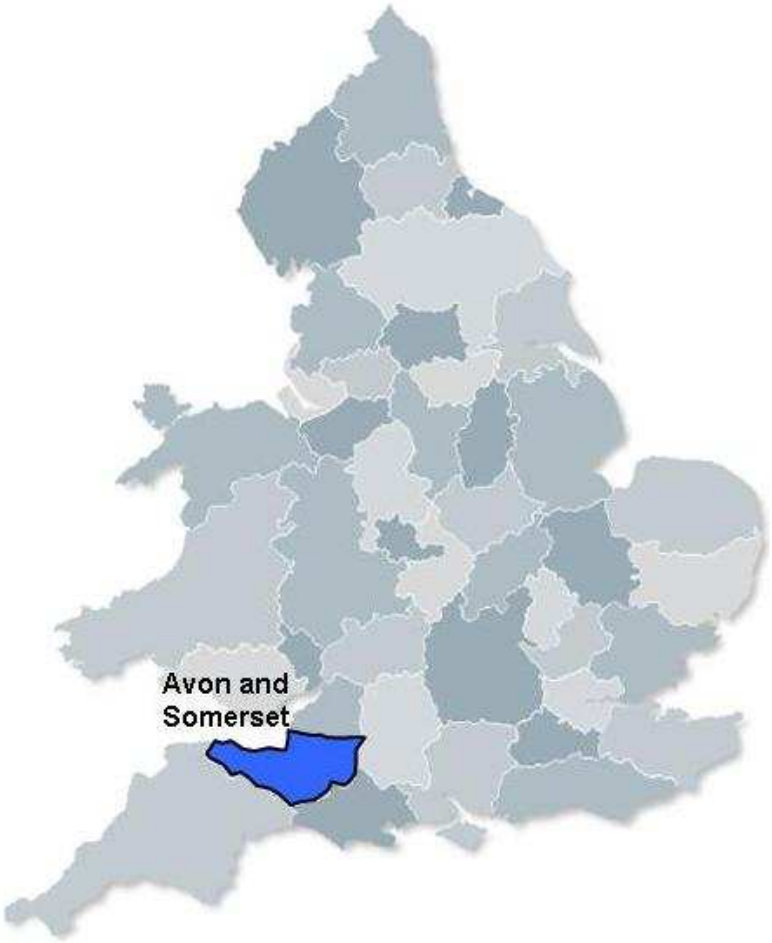


Figure A5 **Location of Avon and Somerset in England and Wales**

Table A8 Review of Avon and Somerset Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map	●			1
Flood Warning	●			1
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business		●		2
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards		●		2
Evacuation routes			●	3
Shelters/Safe havens		●		2
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media			●	3
Assumptions made by the plan		●		2.5
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery			●	3
Training and exercises		●		2
			Average score	2
			Rating	“Average”

Review of Cornwall Multi-Agency Flood Response Plan

The version of the Cornwall MAFP reviewed here was produced in 2004. It is very likely that this document has been updated on a number of occasions over the past six years; however, more recent versions were not available to the project team. Cornwall forms the tip of the south-western peninsula of England. It is bordered to the north and west by the Atlantic Ocean, to the south by the English Channel, and to the east by the county of Devon. The location of Cornwall is shown in Figure A6. In 2008 Cornwall was estimated to have a population of some 534,000 people.

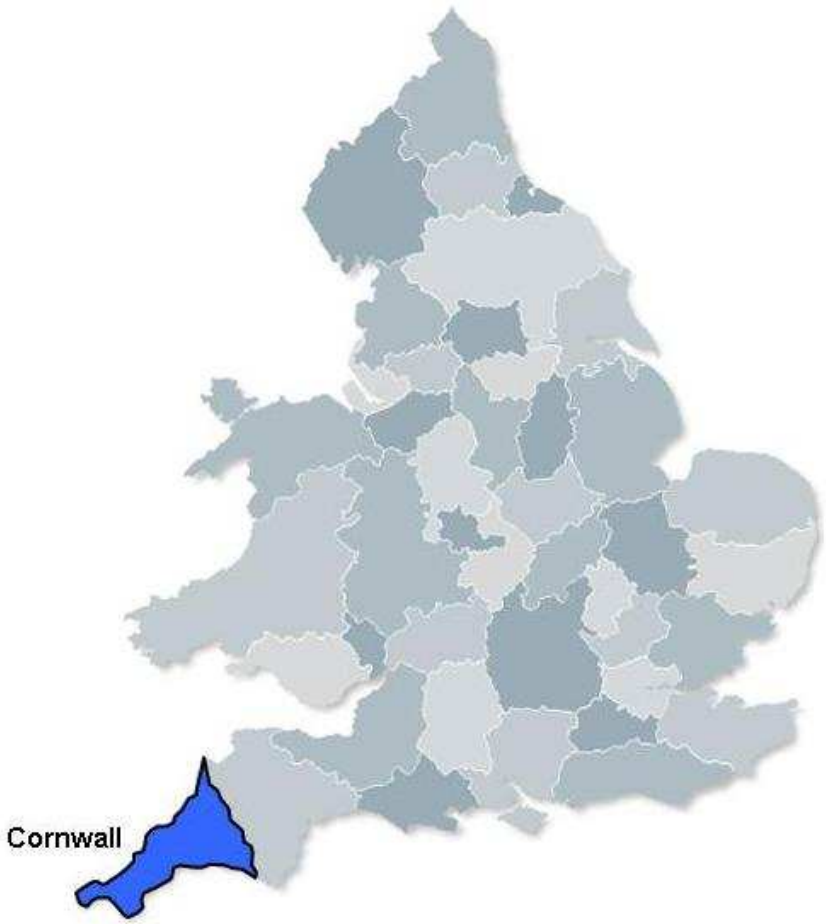


Figure A6 Location of Cornwall in England and Wales

Table A8 provides the ranking for the Cornwall Multi Agency Flood Response Plan. Although the Cornwall MAFP only ranks as an "average" plan it has to be borne in mind that the plan reviewed is almost six years old and will have been updated. The plan reviewed incorporated and made reference to comprehensive maps showing the location of evacuation routes, rest centres and also roads likely to flood. In this respect it provides more details than many of the other more recently produced MAFPs that have been reviewed as part of the research. The Cornwall MAFP also provides examples of flood maps annotated with "local knowledge" that could be of significant use to responders during a flood event. An example of one of these maps is shown in Figure A7. Although the 2004 MAFP is only rated as "average" it would not require too many additions to increase its rating to "above average".

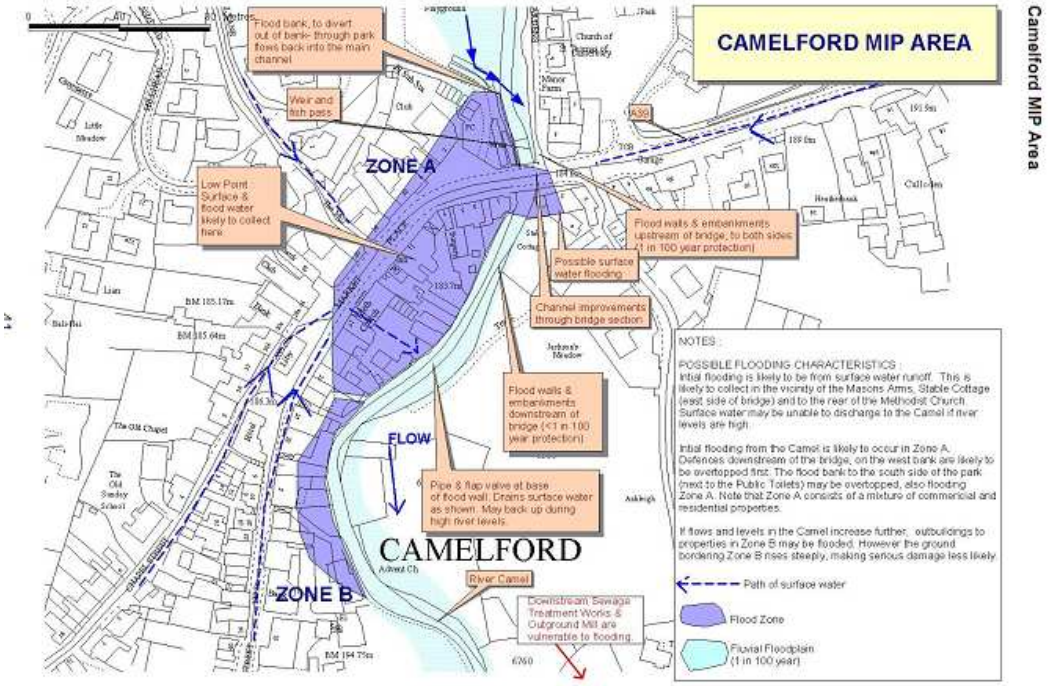


Figure A7 Typical example of a flood map featured in the Cornwall MAFP

Table A9 Review of Cornwall Multi-Agency Flood Response Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods		●		2
Flood hazard map		●		2
Flood Warning			●	3
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business		●		2
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes		●		2
Shelters/Safe havens			●	3
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media			●	3
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery		●		2
Training and exercises		●		2
			Average score	2
			Rating	"Average"

Review of Devon Flood Warning and Response Plan

Devon is the third largest of the English counties and in 2008 had an estimated population of 1,142,000. The location of Devon in England is shown in Figure A8. It is subject to fluvial, flash and coastal flooding. The Devon Flood Warning and Response Plan was produced in April 2004. Similar to the Cornwall MAFP it is likely that this plan will have been updated over the past six years; however, more recent versions were not available to the project team. The map part of the plan excluding maps and Appendices stretches to 196 pages and is well set out. The review of the Devon plan is given in Table A9. Although produced over five years ago the Devon Plan ranks as "above average" and includes much information that is lacking from many of the other MAFPs, for example, the location of facilities in the floodplain such as oil depots and chemical facilities that may lead to a NaTech hazard.

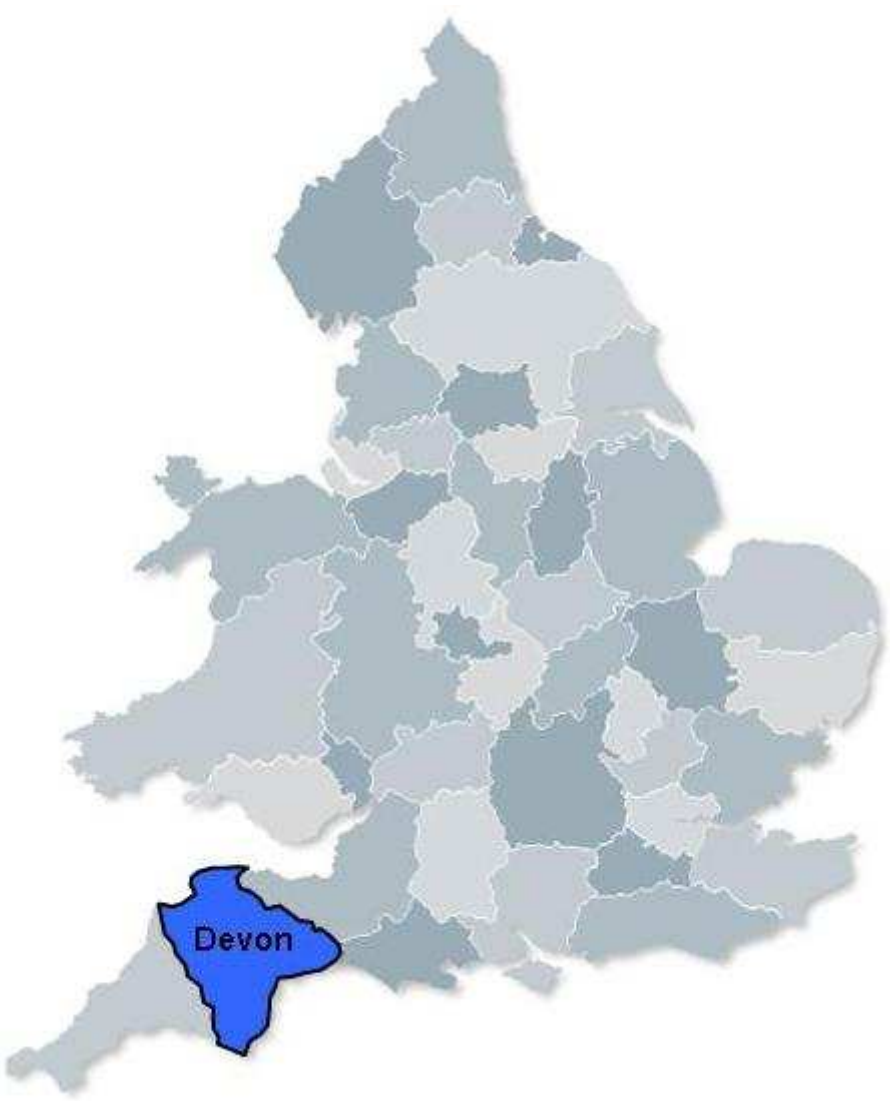


Figure A8 Location of Devon in England and Wales

Table A10 Review of Devon Flood Warning and Response Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating			●	3
Details of previous floods		●		2
Flood hazard map		●		2
Flood Warning			●	3
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business		●		2
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards		●		2
Evacuation routes		●		2
Shelters/Safe havens		●		2
Relationship with complementary emergency plans		●		2
Communication with other agencies			●	3
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan		●		2
Plan activation		●		2
Actions, roles and responsibilities			●	3
Recovery		●		2
Training and exercises		●		2
			Average score	2.2
			Rating	"Above average"

Review of the Hampshire Flood Response Plan

Hampshire is a county on the south coast of England. The county borders Dorset, Wiltshire, Berkshire, Surrey and West Sussex. The county has an area of 3,700 km^2. In 2008 the population of Hampshire was estimated to be approximately 1.7 million. Version 1 of the Hampshire flood response plan produced in December 2007 stretches to 28 pages. As Table A10 below shows the Hampshire Flood Response Plan has very little detail on the effects of flooding on a variety of receptors and as such it scores a relatively low mark and thus is rated as being plan with "considerable room for improvement".

Table A11 Review of Hampshire Flood Response Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map	●			1
Flood Warning	●			1
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies	●			1
Communication with the public	●			1
Management of the media	●			1
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery		●		2
Training and exercises		●		2
			Average score	1.3
			Rating	"Considerable room for improvement"

Review of the Walsall Flood Plan

Walsall is a large industrial town in the West Midlands of England. It is located northwest of Birmingham and east of Wolverhampton. In 2008 it had an estimated population of some 175,000. The Walsall Flood Plan was produced in January 2009. It is an addendum to the major emergency plan for the town. It stretches to 24 pages. Similar to the Hampshire Flood Response Plan it has a lot of generic text but few diagrams. This is one of the reasons that it gained a low score and was rated as a plan with "Room for improvement".

Table A12 Review of Walsall Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map		●		2
Flood Warning		●		2
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media	●			1
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery		●		2
Training and exercises	●			1
			Average score	1.5
			Rating	"Room for improvement"

Review of the North Wales Multi-Agency Flood Plan

The Multi Agency Flood Plan for North Wales has been developed to collate information relating to the roles and responsibilities of organisations that respond to flooding across North Wales in order to improve the multi-agency response and co-ordination of resources during a flooding incident. In its current form, the MAFP provides the first attempt to a means of a Multi Agency Approach to flooding which sets out the generic roles and responsibilities of those involved as well as the planning and response to flooding in those highest flood risk areas across North Wales. The area covered by this plan is shown in Figure A9. The plan is currently in the process of being updated. Table A12 provides the scoring for the metrics for the North Wales MAFP. The MAFP is well put together. The MAFP would have been classified as an "above average" plan if there had been some information on "evacuation routes", "assumptions" and "recovery".

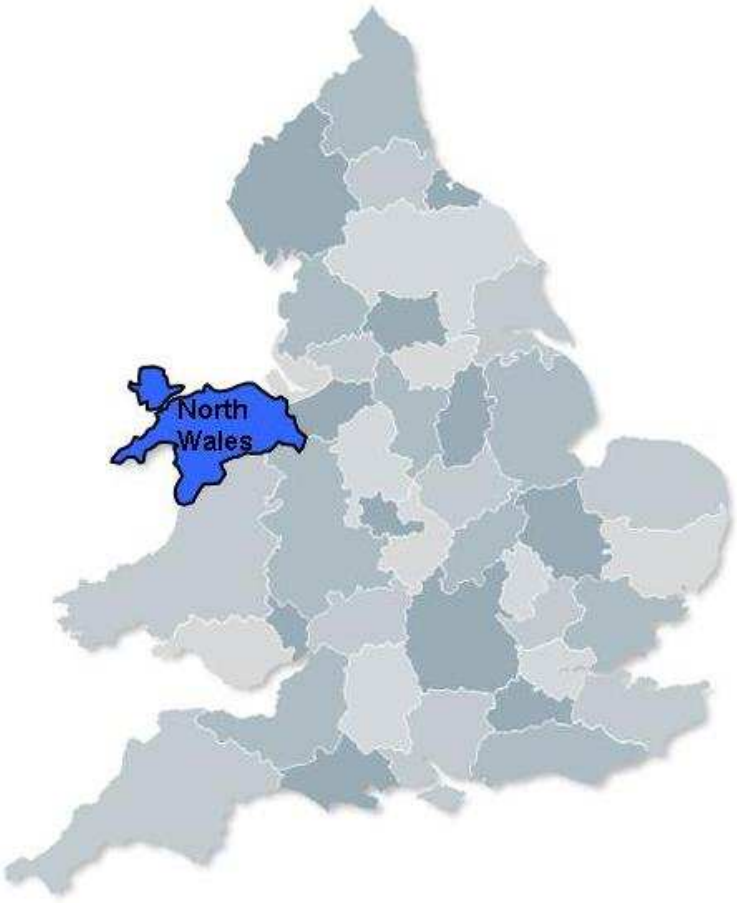


Figure A9 Location of North Wales in England and Wales

Table A13 North Wales Multi-Agency Flood Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	2
Target audience and updating			●	2
Details of previous floods			●	3
Flood hazard map		●		2
Flood Warning			●	3
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business			●	3
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards		●		2
Evacuation routes	●			1
Shelters/Safe havens		●		2
Relationship with complementary emergency plans		●		2.5
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan	●			1
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery	●			1
Training and exercises			●	3
			Average score	2.2
			Rating	“Average”

Appendix B Details of the review of emergency flood plans in France

Introduction

Brief details of these metrics are given in Table 4.3. The plans are ordered according the date of when the plans were first produced. For comparison, two others plans have been assessed. These are the "Dispositif Orsec Zone de Défense de Paris" (DOZDParis) and the Plan de Decours Specialise Inondations Loire (PSSIL) which is a specific emergency plan for floods in the Loire River catchment. These have been compared with a PCS at local scale within the relevant area. The Nanterre PCS has been compared with the DOZDParis and the Brives-Charensac PCSis compared to PSSIL.

Table B1 List of emergency plans reviewed for France

Name of plan	Type of plan	Date of reviewed version	Length of plan (pages)	Average score
Blagnac PCS	Plan Communal de Sauvegarde	2002 updated 2009	58	1.8
Quissac PCS	Plan Communal de sauvegarde	2006	25 plus appendices	2.2
Perpignan PCS	Plan Communal de Sauvegarde	June 2006	192 plus maps	2
Metz PCS	Plan Communal de Sauvegarde	September 2007	69	2
Brives-Charensac PCS	Plan communal de Sauvegarde	September 2007	6.	2
Plan de Secours Spécialisé Inondation Loire	Emergency plan for the upstream part of the Loire River catchment	2004 updated 2009	23	1.9
Nanterre PCS (local emergency plan)	Plan communal de sauvegarde	2007	104 plus appendices	2.1
Le Cailar PCS	Plan Communal de Sauvegarde	October 2007	26 plus appendice	2.4
Nice PCS	Plan Communal de sauvegarde	31 October 2007	24 appendices	2
Cléry Saint-André PCS	Plan Communal de Sauvegarde	2009	613	2.4
Nancy PCS	Plan Communal de Sauvegarde	2009	49	1.4
Saint Raphael PCS	Plan Communal de Sauvegarde	2009	142	1.5
Piolenc PCS	Plan Communal de Sauvegarde	April 2009	122	1.4
Sommières PCS	Plan Communal de Sauvegarde	17 April 2009	87	2
Dispositif Orsec	Regional Emergency plan	October 2009	23 plus	2.1

Zone de Défense de Paris	region Ile-de-France	Draft version	appendices	
Tarascon PCS	Plan Communal de Sauvegarde	2006 updated in November 2009	92 plus appendices	1.8
Average score				*2*

Review of the Blagnac plan communal de sauvegarde according to the metrics

Name of plan	Plan Communal de Sauvegarde de la Ville de Blagnac (Haute-Garonne – 31).
Name of geographical area covered by the plan:	City of Blagnac.
Date when the plan was produced:	March, 2002. Updated in 2009
Approximate area covered by the plan:	Area : 16,88 km². Area prone to flood : 3 km² (300ha)
Approximate number of people living in the area covered by the plan.	21 199 inhabitants (2006). Inhabitants prone to flood: 2 000 maximum.
Length of the plan:	58 pages.
Aim of the plan:	Setting up of an organisation to handle crisis
Brief comments:	Multirisk plan including natural and technological hazards. Detailled scheme of ableau très détaillée dans les niveaux d'alerte selon la côte du cours d'eau et les actions à mener en conséquence.

Blagnac is a town of south-western France located in the urban area of Toulouse. 21 199 inhabitants lived in Blagnac in 2006. The city is concerned with flood risk and industrial risk owing to the airport which had attracted some industries especially a stock of oil and gasoline Groupement d'Avitaillement pour Toulouse (G.A.T.). The commune is also prone to dam failure and transportation of dangerous goods.

Concerning flood hazard, Blagnac is exposed to the flooding of Garonne River. The reference in this matter was the flood of 21st to 24th June 1875 who triggered a huge death tool (500 fatalities which 9 of them in Blagnac). The fatalities were mainly due to building collapsing.
In 1952 and 1977 floods caused much damage but not fatalities the flood prone zone stretches over 3 km^2 and affects 2000 persons. The section of Garonne River which streams across Blagnac is bordered by a dike system built after the 1930 event. New dikes were erected in 1973 and 1974 and have just been heightened for 25 cm. Dikes are a shortcoming in flood defence. In 1977, properties located behind the dike had been flooded.

The PCS is as many a multi risk plan. The version we assessed is the synthetic one which is disseminated online to the population. The PCS is very practical and "operational" and focuses on the water level threshold and the action to be carried out according those levels. The census of assets (flood risk to people economical assets….) and potential damage is poor as in many others PCS. Unless the note suggests room for improvement, (the "score" is 1.8), the handling of a crisis seems to be well addressed by the municipal authorities.

Table B2 Review of Blagnac plan communal de sauvegarde according to the metrics

Metric	Poor	Acceptable	Good	Score
Aims and objectives of plans		●		2,5
Target audience and updating		●		2
Details of previous floods			●	3
Flood hazard map	●			1
Flood Warning		●		1,5
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens			●	3
Relationship with complementary emergency plans		●		1,5
Communication with other agencies		●		2
Communication with the public		●		2
Managment of the media	●			1
Assumptions made by the plan		●		2
Plan activation			●	3
Actions, roles and responsibilities		●		2
Recovery		●		2
Training and exercises		●		2
			Average	**1.8**

Figure B1 The location of Blagnac

Review of Quissac plan communal de sauvegarde

Name of plan	Plan Communal de Sauvegarde of Quissac
Name of geographical area covered by the plan:	City of Quissac.
Date when the plan was produced:	July, 2006.
Approximate area covered by the plan:	23.32 km².
Approximate number of people living in the area covered by the plan.	2 569 inhabitants in 2006.
Length of the plan:	200 pages.
Aim of the plan :	Define the organization and the action strategies to implement in view of any crisis.
Brief comments:	Plan organized according to three booklets: Communal Organization and Procedures of the crisis management, a graduated intervention plan for flood management and an appendix with, a report/account of meetings, a directory of crisis…

The commune of Quissac is located in southern France. 2569 people lived there in 2006. This is a rural commune only the old village centre is prone to floods. Quissac is prone to the torrential flood of Vidourle River and the Garonnette catchment (2 km^2 but specific discharge exceeds 10 $m^3/s/km^2$ during hugest floods). One elderly person died during the 9th September 2002 floods downstream the Garonnette basin. The PCS has been drawn in December 2006 by a consultant called predict services who is specialized in setting up such plans. The maps are very accurate and numerous (11 maps).

There are two can of maps: maps representing elements at risk such as flood prone houses and major assets at risk The other kind of maps are “action Maps” i.e. maps that that draw the different actions to do in case of crisis (to close different street, to supervise both rivers.

Nevertheless, for some items, maps could be more accurate e.g. the sheltering, or risk to vulnerable people although the authorities have got an updated list of vulnerable people.

The length of the hard copy seems good neither too long (not easy to use in case of crisis) and neither too short by overlooking some important details. A training exercise was hold in 2006 the 21st of September. A short report lessens this exercise in the PCS.

The average note is rather high owing to the use of many maps.

Table B3 Review of the PCS of Quissac according to the metrics

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map		●		2.5
Flood Warning			●	3
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business		●		2
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards			●	3
Evacuation routes		●		2
Shelters/Safe havens		●		2
Relationship with complementary emergency plans	●			1
Communication with other agencies			●	3
Communication with the public			●	3
Management of the media	●			1
Assumptions made by the plan		●		2
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery		●		2
Training and exercises			●	3
			Average	**2.2**

Figure B2 The location of Quissac

Review of Perpignan plan communal de sauvegarde

Name of plan	Plan Communal de Sauvegarde City of Perpignan.
Name of geographical area covered by the plan:	City of Perpignan
Date when the plan was produced:	June 2006
Approximate area covered by the plan:	68,07 km².
Approximate number of people living in the area covered by the plan.	116 041 inhabitants (2007). People at risk : First scenario : 631 inhabitants Second scenario: 3 610 inhabitants Third scenario: 17 098 inhabitants Fourth scenario: 18 528 inhabitants
Length of the plan:	191 pages
Aim of the plan:	This operational document is intended to help the inhabitants in case of flood (by a river or by rain). It allows to persons to know where they are within the crisis organization and knowing how realized the actions to do according to every scenario.
Brief comments:	The document, only dedicated to floods is divided into seven separated folders (crisis organization, decisional cell, coordination pole, communication pole, switchboard crisis, intervention pole and the

	last one appendix). It addresses four different scenarios (one for a pluvial situation and the three others linked to the overflowing of the river “Têt” for two return periods (50-year, 100-year) and the flood of 1940). Plan very detailed.

Perpignan is a town of French Mediterranean low plain in the region Languedoc-Roussillon. 116,041 people lived in the town in 2007. Three kind of flooding has been identified:

- Fluvial flooding due to Têt River which an about two hundred years return period flood occured in October 1940. Têt River is the main danger (a man died in November 2005).
- The overflowing of several channels streaming through the city (e.g. la Basse, le Grand Vivier, le Ganganeil…);
- Local runoff owing to the overflowing of sewage system.

The PCS was first drawn in 2006. It is very operational with “action cards” very precise and detailed actions according to the level of crisis. According to the “metrics”, the plan is “average”. But we can suppose that it is underestimated given that the good criterion rests on the presence of charts probably available in addition (as we can see it in the information memoranda to the public or the hydraulic study).

Two general scenarios are drawn: fluvial and pluvial flooding. For fluvial case, 3 levels of danger are foreseen depending on water depth and flood extension. Maps are available for each scenario but they are not published.

Table B4 Review of the Perpignan plan communal de sauvegarde according to the metrics

Metric	•	Acceptable	Good	Score
Aims and objectives of plans		•		2
Target audience and updating		•		2
Details of previous floods	•			1
Flood hazard map		•		2
Flood Warning			•	3
Risk to people		•		2
Risk to vulnerable people	•			1
Flood risk to residential properties		•		2
Flood risk to business		•		2
Flood risk to critical infrastructure	•			1
Potential for NaTech hazards	•			1
Evacuation routes		•		2
Shelters/Safe havens	•		•	3
Relationship with complementary emergency plans	•			1
Communication with other agencies			•	3
Communication with the public			•	3
Managment of the media			•	3
Assumptions made by the plan	•			1
Plan activation			•	3
Actions, roles and responsibilities			•	3
Recovery	•			1
Training and exercises	•			1
			Average	**2**

Figure B3 The location of Perpignan

Review of the Tarascon plan communal de sauvegarde according to the metrics

Name of plan	Plan Communal de Sauvegarde of Tarascon.
Name of geographical area covered by the plan:	Commune of Tarascon (Bouches-du-Rhône).
Date when the plan was produced:	2006, Last updating in November, 2009.
Approximate area covered by the plan:	73,97 km².
Approximate number of people living in the area covered by the plan.	13 376 inhabitants (2006).
Length of the plan:	92 pages.
Aim of the plan:	Le Plan Communal de Sauvegarde is defined as the first operational response to a danger (natural or technological).
Brief comments:	The plan develops a multirisk approach. An annual updating is planned. The commune is strongly involved in improving the document PCS.

Tarascon is a commune of the South of France with 13376 inhabitants (in 2006) located out of left bank of the Rhone River. It belongs to the department of Bouches-du-Rhône, in the region Provence-Alpes-Cote-d'Azur. The commune of Tarascon is exposed to 2 natural hazards (flooding and forest fires) and 3 technological dangers (industrial plants, transportation of dangerous goods and dam failure. Flood risk is due to the Rhone River, the Vigueirat channel and local urban runoff. The slow rising floods of the rhone river use to occur with complicated scenarios owing to the functioning of some spillway in the dike system

and sometimes aggravated by dike failure like in December 2003. In case of dike failure, quite all the territory of the commune is threatened.
The PCS is multi risk and the assessed version is dated to 2009. The crisis management organisation is set up by cells each of them take in charge an aspect of crisis management (warning, information, assistance to affected people…). A plan for sheltering has been drawn and is available on the city website. Nevertheless, the room for improvement (the score is 1.8) is rather high mainly by disseminating more information to the population. As in many PCS, the mapping of elements at risk is not developed even if the vulnerabilities of the territory are known by the authorities.

Table B5 Review of the Tarascon plan communal de sauvegarde according to the metrics

Metric	Poor	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods	●			1
Flood hazard map	●			1
Flood Warning		●		1.5
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties		●		1.5
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes		●		1.5
Shelters/Safe havens			●	3
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media			●	3
Assumptions made by the plan	●			1
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery		●		2
Training and exercises	●			1
			Average	**1.8**

Figure B5 Location of Tarascon

Review of the Metz plan communal de sauvegarde

Name of plan	Plan Communal de Sauvegarde de Metz
Name of geographical area covered by the plan:	Ville de Metz
Date when the plan was produced:	September, 2007.
Approximate area covered by the plan:	41,22 km².
Approximate number of people living in the area covered by the plan.	127 498 inhabitants (2006).
Length of the plan:	69 pages.
Aim of the plan:	To set up tools and procedures to face up a crisis at local level
Brief comments:	The document addresses trigger levels, crisis management and Information to population which is completed with the DIRCIM. Protection and prevention methods are also showed

According to the 2006 census, the city of Metz had a population of approximately 127, 498. It is situated in the north-eastern part of France. This town is the prefecture of the department of Moselle and of the metropolitan region of Lorraine.

Metz is located at the junction of the Moselle and the Seille River which undergo slow risings floods on a large plain (what facilitates the interventions in case of emergency). They occur primarily during the winter season (from November to April) with sometimes a worsening factor owing to the melting down of snow (in the Vosges Mountains). The city has undergone since 1950 4 major floods since 1950: December 1947 (reference flood because of the simultaneous rising of the Moselle and Seille Rivers), December 1982, April 1983 and May 1983. The Seille River, tributary of the Moselle knew 2 very important risings in October 1981 and April-May 1983.

Moreover, the city undergoes some urban floods due to the growing surface of impervious areas. Some parts of the town are regularly invaded by waters (small catchments of Vallières, Saint Pierre, Bonne Fontaine and la Cheneau). Thus, flood retention basins and pump has been set up in Metz to reduce the flood risk.

The PCS was drawn in 2007 and uploaded online It Include the DICRIM. The document is an abstract version. The maps for instance have not been included but the document refers to them. The stakes are described in the scenarios by the name of the affected streets what let us suppose that they also come out on maps. Using the metrics developed the Metz PCS was found to be “average”.

Table B6 review of the Metz plan communal de sauvegarde according to the metrics

Metric	Poor	Acceptable	Good	Score
Aims and objectives of plans			•	3
Target audience and updating			•	3
Details of previous floods		•		2
Flood hazard map			•	3
Flood Warning			•	3
Risk to people	•			1
Risk to vulnerable people		•		2
Flood risk to residential properties1		•		2
Flood risk to business1		•		2
Flood risk to critical infrastructure1		•		2
Potential for NaTech hazards	•			1
Evacuation routes	•			1
Shelters/Safe havens		•		2
Relationship with complementary emergency plans		•		2
Communication with other agencies		•		2
Communication with the public		•		2
Managment of the media		•		2
Assumptions made by the plan	•			1
Plan activation			•	3
Actions, roles and responsibilities		•		2
Recovery		•		2
Training and exercises		•		2
			Average	**2.0**

Figure B6 The location of Metz

Review of Brives-Charensac plan communal de sauvegarde (PCS)

Name of plan	PLAN COMMUNAL DE SAUVEGARDE
Name of geographical area covered by the plan:	Commune of Brives-Charensac (Haute-Loire, 43)
Date when the plan was produced:	Octobre, 2007
Approximate area covered by the plan:	Area of the commune: 4,87 km²
Approximate number of people living in the area covered by the plan.	(Inhabitants: 4 577 by 03/29/2007). ------- Zone 7 : 300 campers Zone 8: 35 Inhabitants Zone 9 : 380 Inhabitants Zone 10 : 535 inhabitants + 54 children (pupils). ⇨ 1.304 inhabitants
Length of the plan:	67 pages.
Aim of the plan:	Recenser l'ensemble des risques majeurs répertoriés sur le territoire communal ainsi que les dispositifs d'alerte et d'information mis en place par les services municipaux / This document lists the hazards within the municipality and also the warning plans and information set

	up by the municipals authorities in case of crisis.
Brief comments:	Flood risk is also detailed in the Plan de prévention des risques (PPR) approved in 23/12/1998. It analyses the flood hazard for following frequencies: 1 in 10, 1 in 30 and 1in 100 years. Multirisk plan.

Brives-Charensac is a commune of the centre of France which gathers 4118 inhabitants (2006). The commune took advantage of the closeness of le Puy-en-Velay urban area (40000 inhabitants) and the population rose from 2000 to over 4000 between 1962 and 1982. Since 1982, the number of inhabitants has been quite constant. The commune was struck by the flash floods of the Loire River which triggered 9 fatalities in 1980 September the 21st. After those flash floods - the worst since 1750 -, some relocations of flood prone industrial plants were undertaken in the commune. The factories had been relocated in neighbouring communes.
Because of this "recent" disaster, the awareness of flood risk is developed in the commune and the local authorities had drawn a PCS. A local emergency plan existed before the current PCS. With neighbouring communes of Chadrac, Chaspinhac, Coubon and Le Monteil, Brives-Charensac is included in the "plan de secours specialise inondations Loire[3]" (PSSIL). The PSSIL is complementary to the PCS of Brives-Charensac. A description of the PSSIL is given just after.

The Table B7 provides a brief review of the Brives Charensac PCS using the metrics developed as part of FIM FRAME. The plan was found to be just on "average".

Table B7 Review of the PCS of Brives-Charensac according the metrics

Metric	Room for improvement	Acceptable	Good	Score	comments
Aims and objectives of plans			●	3	
Target audience and updating			●	3	
Details of previous floods		●		2	refer to other plans
Flood hazard map		●		2	
Flood Warning		●		2	
Risk to people		●		2	
Risk to vulnerable people	●			1	
Flood risk to residential properties	●			1	
Flood risk to business	●			1	
Flood risk to critical infrastructure		●		2	
Potential for NaTech hazards	●			3	
Evacuation routes	●			1	
Shelters/Safe havens	●			1	
Relationship with complementary emergency plans			●	3	
Communication with other agencies			●	3	
Communication with the public		●		2	

[3] Specific emergency plan for Loire's floods

Managment of the media	•			1	
Assumptions made by the plan		•		2	
Plan activation			•	3	
Actions, roles and responsibilities		•		2.5	
Recovery		•		1.5	only advices
Training and exercises	•			1	
			Average	**2.0**	

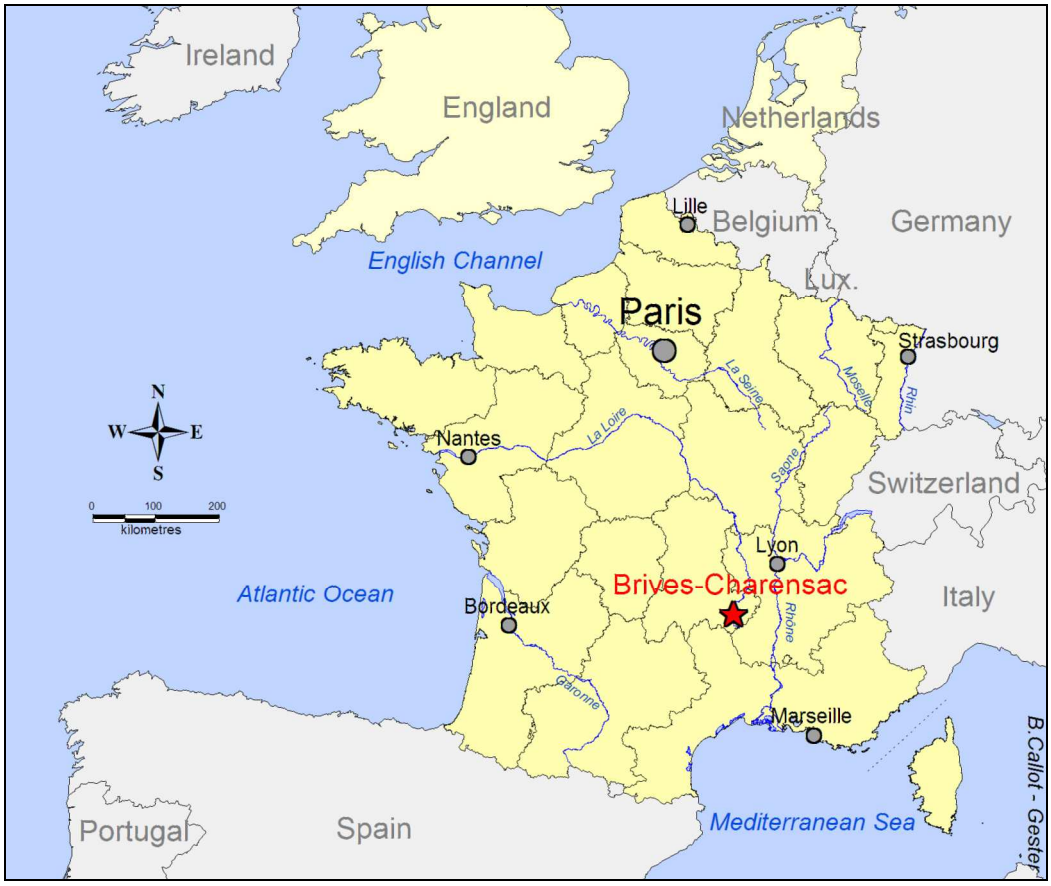


Figure B6 The location of Brives-Charensac

Review of the PSSIL « plan de secours spécialisé inondation Loire »

Name of plan	Plan de Secours Spécialisé Inondations Loire (P.S.S.I.L)
Name of geographical area covered by the plan:	5 communes of the Le-Puy-en-Velay urban area (Chadrac, Chaspinhac, Coubon, Le Monteil et Brives-Charensac).
Date when the plan was produced:	April, 2009 (latest version). (first version 04/2004)
Approximate area covered by the plan:	5 municipalities = 48,74 km² : - Brives-Charensac : 4,87 km² - Chadrac : 2,48 km² - Chaspinhac : 16,44 km² - Coubon : 22,73 km² - Le Monteil : 2,22 km²
Approximate number of people living in the area covered by the plan.	5 municipalities = 11 363 inhabitants: - Brives-Charensac : 4 577 (2007) - Chadrac : 2 086 (2007) - Chaspinhac : 710 (2007) - Coubon : 3 400 (2008) - Le Monteil : 590 (2007)
Length of the plan:	23 pages.
Aim of the plan:	To alert stakeholders and population from a rising of Loire River.
Brief comments:	This (short) plan completes the Brives-Charensac PCS.

The PSSIL covers 5 communes prone to Loire flood near the city of Le Puy (department of Haute-Loire, centre of France). It is complementary to the PCS of the communes (see above the example of Brives-Charensac) The PSSIL stretches only to 23 pages but refers many times to the PCS of the communes including Brives-Charensac. It was drawn first in 2004. The version reviewed below is the 2009 version. The plan is triggered by the prefecture (state authority).

Table B8 Review of PSSIL (plan de secours specialise inondation Loire)

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans	●			1
Target audience and updating	●			1
Details of previous floods[1]			●	3
Flood hazard map[1]			●	3
Flood Warning		●		3
Risk to people		●		2
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech			●	3

hazards				
Evacuation routes		•		2
Shelters/Safe havens			•	3
Relationship with complementary emergency plans[2]		•		2
Communication with other agencies		•		2
Communication with the public			•	3
Managment of the media	•			1
Assumptions made by the plan		•		2
Plan activation			•	3
Actions, roles and responsibilities		•		2.5
Recovery	•			1
Training and exercises	•			1
			Average	

Figure B7 Location of the PSSIL

Combined analyse of Brives-Charensac PCS and PSSIL

We calculate the joined score for PSSIL and Brives-Charensac PCS. For each metric, we kept the highest score of either PSSIL or Brives-Charensac PCS. The score of both plan together reaches 2,2. So it shows that sometime the coordination of both plans at different levels (regional and local) enhance the effectiveness of emergency planning.

Average score of Brives-Charensac PCS: 2
Average score of PSSIL: 1.7
Average score of both plan (best score for each metric): 2.2

Review of Nanterre Plan communal de sauvegarde

Name of plan	Plan Communal de Sauvegarde of Nanterre - Outil d'aide à la gestion communale de crises.
Name of geographical area covered by the plan:	Nanterre
Date when the plan was produced:	2007.
Approximate area covered by the plan:	12,2 km².
Approximate number of people living in the area covered by the plan.	86 700 inhabitants More than 3 500 people are prone to flood.
Length of the plan:	104 pages.
Aim of the plan:	Help to manage situations that may threaten people, property and environment that tend to disrupt the normal functioning of the city.
Brief comments:	The municipality is submitted to a PPRI (2004) and two PPI (technological dangers).

Nanterre is a city of 88 875 inhabitants in 2007. It is located in the western part of Paris urban area. Nanterre is prone to the floods of Seine River. The 1910 huge floods are the major reference for flood hazard. The type of flooding of Seine River in this town is slow rising flood. Thus, some metrics are not relevant e.g. the risk of building collapsing.

Many studies has been led to describe the effect of a new flood such as 1910 one. The stakeholders for example EDF (the national electricity supply company in France) made simulations about the impacts of such a flood. The city of Nanterre has used those studies to improve its local emergency plan. In another way, Nanterre is prone to technological risk (burst of seveso plants). Thus, as many PCS, the PCS of Nanterre is a multi risk plan including natural and technological risks. But, the "technological" part and "natural" part of the PCS had been drawn separately. Thus, if the technological risk is clearly addressed, the link between flood and technological risk (contamination or explosion) is not clearly mentioned.

According the table of the metrics below, the note is « average". There is a room for improvement and the authorities are currently working on it. Till now, the organisation (shelters, evacuations plans…) is mostly planned for technological risk but can be used for natural risk such as floods. Some points of flood crisis management have not been addressed yet because they are first tested for technological risk (evacuation for example). Owing to the focusing on the 1910 historical one hundred year return period flooding, the intermediate levels of flooding (30 or 50 years return period) are not really addressed.

Table B9 Review of the PCS of Nanterre according to the metrics

Metric	Room for improvement	Acceptable	Good	Score	Comments
Aims and objectives of plans			●	3	
Target audience and updating		●		2	
Details of previous floods			●	3	
Flood hazard map		●		2	
Flood Warning		●		2	
Risk to people		●		2	
Risk to vulnerable people	●			1	list
Flood risk to residential properties			●	3	risk of building collapsing is not relevant
Flood risk to business	●			1	
Flood risk to critical infrastructure		●		2	
Potential for NaTech hazards	●			1	known but not drawn on maps
Evacuation routes	●			1	for technological risk only
Shelters/Safe havens		●		2	List only
Relationship with complementary emergency plans			●	3	
Communication with other agencies			●	3	
Communication with the public			●	3	
Managment of the media		●		2	
Assumptions made by the plan			●	3	
Plan activation		●		2	
Actions, roles and responsibilities		●	●	2.5	
Recovery	●			1	
Training and exercises		●		2	for technological risk included in the plan
			Average	**2.1**	

Figure B8 location of Nanterre

Review of the DOZDP Dispositif Orsec zone de défense de Paris (flood part)[4]

Name of plan	Dispositif Orsec inondations zone de défense de Paris
Name of geographical area covered by the plan:	Region Ile de France
Date when the plan was produced:	2006 updated version in 2009
Approximate area covered by the plan:	Region Ile-de-France 12012 km2 (Urban area of Paris gathers 90 % of the population of the region)
Approximate number of people living in the area covered by the plan.	11.6 millions of inhabitants 868,000 people are prone to flood and 1.3 millions affected
Length of the plan:	103 pages.
Aim of the plan:	To Prepare authorities and stakeholders to manage a crisis
Brief comments:	The plan is mainly dedicated to critical infrastructure holders (gas electricity supply companies, railways..) to tell them when and how they can handle a crisis. The reference of crisis are the 1910 floods in the basin of Seine River.

[4] Orsec plan in short

The plan follows « the Plan de secours spécialisé inondations zone de défense de Paris ». This plan had been elaborated in order to give a response in case of a general crisis (health, industrial or natural risk) in the Paris urban area that gathers 10.2 millions of people. We only assessed the part of the plan dedicated to the Seine River and tributaries' flooding. The reference in flood is the one hundred year return period flood of January 1910. IN case of a similar scenario, a study of IAURIF state that 868,000 people would be directly affected by seine flooding in Paris Urban area.

The Orsec looks like an organisation set up rather than a real plan. The aim of this plan is to organise the emergency response so the available documents are not directly dedicated to the population but to the stakeholders. Indeed, the flood warning levels are very detailed according the depth of waters at the Austerlitz Bridge in Paris. The Orsec plan is very detailed on the warning level

Another key question is the territorial scale. The Orsec plan is drawn at regional scale. So the some topics are not relevant at this scale. For example, it is not possible to plan the evacuation of all the people affected by flood in the Paris Urban area. So the problem of evacuation is not really addressed in this version of the plan. The plan focuses its attention on the defence of critical infrastructures such as gas network, subway, drinking water supply, light… The plan helps and asks for the 19 major stakeholders to organise their own response to major crisis.

Nanterre PCS (see above) is an application at local level of this Orsec plan. The warning levels are the same for Nanterre and the whole western part of Paris Urban area. (Austerlitz Bridge located in the centre of Paris city).

Table B10 Review of the DOZDP Dispositif Orsec Paris according to the metrics[5]

Metric	Room for improvement	Acceptable	Good	Score	comments
Aims and objectives of plans		●		2	
Target audience and updating			●	3	
Details of previous floods	●			1	
Flood hazard map		●		2	Maps not detailed for all the levels of flooding
Flood Warning			●	3	
Risk to people		●		2	
Risk to vulnerable people		●		2	
Flood risk to residential properties		●		2	
Flood risk to business		●		2	
Flood risk to critical infrastructure			●	3	Very detailed for each stakeholder
Potential for NaTech hazards		●		2	
Evacuation routes		●		2	
Shelters/Safe havens		●		2	Not relevant
Relationship with complementary emergency plans		●		2	
Communication with other agencies			●	3	
Communication with the public	●			1	
Management of the media		●		1	
Assumptions made by the plan			●	3	
Plan activation			●	3	
Actions, roles and responsibilities			●	3	
Recovery	●			1	
Training and exercises		●		2	
			Average	**2.1**	

[5] Orsec plan in short

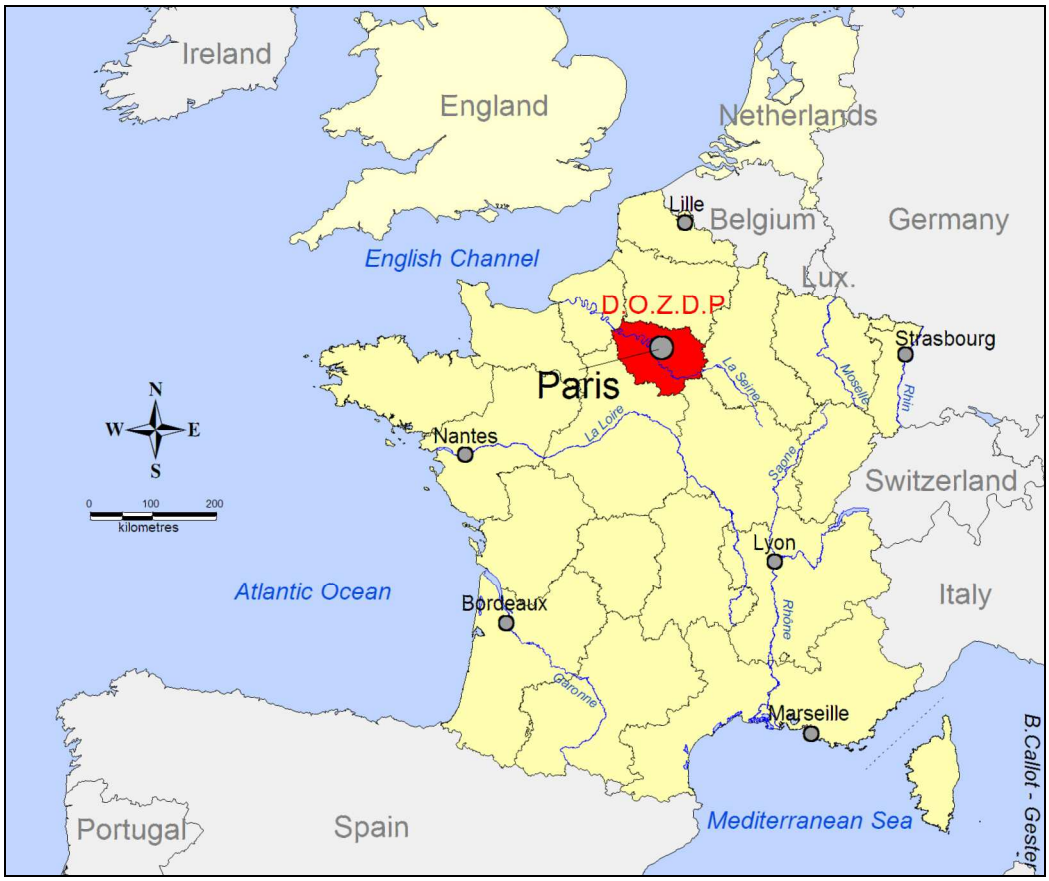


Figure B9 The location of "zone de défense de Paris"

Combined analyses of Nanterre PCS and DOZDParis

If we score the combination of Nanterre PCS and the DOZDP, the score reaches
As for Brives-Charensac and PSSIL reviewed above we calculated the combined scoring of both plans by keep the highest mark for each metric. As for Brives-Charensac and PSSIL, it shows that sometimes, the coordination of both plans at different levels (regional and local) enhance the effectiveness of emergency planning.

- Score of Nanterre PCS: 2
- Score of DOZDParis: 2.1
- Combined score: 2.5

Review of Le Cailar plan communal de sauvegarde

Name of plan	Plan Communal de Sauvegarde of Le-Cailar
Name of geographical area covered by the plan:	The commune of Le Cailar.
Date when the plan was produced:	October, 2007.
Approximate area covered by the plan:	2 369 inhabitants (2006).
Approximate number of people living in the area covered by the plan.	30,01 km².
Length of the plan:	26 pages + appendix.
Aim of the plan:	To inform residents about hazards affecting the commune and to set up measures of prevention and emergency response.
Brief comments:	As the commune is prone to floods from three different rivers; Each river has its own warning system and the procedures to carry out according to the trigger threshold are described for each river too. The synthetic version is rather short but weighty appendix had also been consulted.

2369 inhabitants lived in the commune of Le Cailar in 2006. The commune is located on the French Mediterranean low plains in administrative region of Languedoc-Roussillon. 3 rivers stream across the commune le Vistre, le Rhôny and la Cubelle which is a tributary of Vidourle River. Owing to the very flat topography almost all the territory is prone to flooding. Only the centre of the village is free from floods. Many dikes “protects” the urban area but the design value of dike system is low and dikes use to break. Many houses remain isolated in the low plain when flood occurs.

The commune has been struck by floods in October 1988 (Rhôny River), September 2002 (Vidourle River) and September (Vistre River); thus the PCS is often triggered and the local authorities have a good experience of flood incident management. The worst scenario would be the combination of an extreme discharge of all the rivers at the same time. This scenario is not to be handled by the local authorities. When we asked about that, the authority of the municipally told us that, in any way, handling such an extreme event would overcome the competencies of the commune.
A flood event management plan (non in written version) already existed since 1991. The current PCS in hard copy version was drawn in 2007 (adopted in October 2007) to conform to legal requirement (law of September 2005).

The crisis management is addressed by geographical zone corresponding to different catchments, then by level of risk for which each cell applies the planned “action cards”. According to the metrics the plan was found to be above average (2.2). Indeed, the plan is rather complete. Several sorters give all the details by crisis managers use a synthetic version of the PCS. The global volume of the PCS is more than 500 pages (see photo) and it is sometimes difficult to find the relevant information.

The main shortcoming is the identification and the mapping of elements at risk even if a list registered people at risk. The mapping is not necessary in this condition.

Photo B1 **The whole hard copy version of Le Cailar PCS (Photo taken in the city hall of Le Cailar, F. Vinet)**

A handwriting updating has been made in October 2009 by collecting the phone numbers of new inhabitants. As for the commune of Sommières, training and exercises are not planned owing to the frequency of real floods sometimes several times per year. We score “good” for this metric.

Table B11 Review of le Cailar plan communal de sauvegarde according to the metrics

Metric	•	Acceptable	Good	Score
Aims and objectives of plans			•	3
Target audience and updating		•		2
Details of previous floods			•	3
Flood hazard map		•		2
Flood Warning			•	3
Risk to people		•		2.5
Risk to vulnerable people	•			1
Flood risk to residential properties			•	3
Flood risk to business	•			1
Flood risk to critical infrastructure	•			1
Potential for NaTech hazards			•	3
Evacuation routes			•	3
Shelters/Safe havens			•	3
Relationship with complementary emergency plans		•		2
Communication with other agencies			•	3
Communication with the public		•		2
Management of the media	•			1
Assumptions made by the plan		•		1.5
Plan activation			•	3
Actions, roles and responsibilities			•	3
Recovery			•	3
Training and exercises			•	3
			Average	**2.4**

Figure B10 The location of Le Cailar

Review of the Nice plan communal de sauvegarde

Name of plan	Plan communal de sauvegarde Nice
Name of geographical area covered by the plan:	City of Nice.
Date when the plan was produced:	October, 2007.
Approximate area covered by the plan:	71.92 km².
Approximate number of people living in the area covered by the plan.	348,721 inhabitants in 2007
Length of the plan:	?
Aim of the plan:	To prepare the institutional management of a crisis in the city of Nice and to inform the population about risks they are facing to
Brief comments:	Multi risk plan. The plan is made up of 2 parts: Organization of crisis management and the local diagnosis of both risks and vulnerability.

Nice is a city at the very south-eastern part of France (near the Italian border). It is the prefecture of the Alpes-Maritimes department in the region province-Alpes-Cote-d'Azur.
It is the 5th French city with a population of 348, 721 inhabitants in 2007. She is located on the Mediterranean seaside along the "Bay of the Angels".

The hydrographical network is made with two main rivers submitted to frequent flash floods: the Var River at the western part and the Paillon River embedded under the city in tunnels. Several temporary streams run down from the surrounding hills during severe showers.

The PCS is a “multi risk” one, accessible -as the DICRIM- on the city website where several pages are dedicated to the major risks that Nice City needs to cope with :
The commune is concerned with the following risks:

Natural Risks: floods, landside and subsidence, earthquake, forest fires, extreme weather conditions.
Technological Risks: Transportation of dangerous goods, Seveso industrial plants, littoral pollution.

The consulted document (and evaluated) has been published in 2 parts:

- Version 2 of the 29th of august 2007 for the diagnosis of hazards and vulnerabilities.
- Version 3 of 31 Oct. 2007 for the organization of crisis management.

We were not allowed to read the emergency cards but we know that the rely on two generic plans and seven thematic plans adapted to each risks (forest fire, earthquake…).
According to the metrics, the score is average (2). Contrary to the majority of the plans already assessed, the mapping of hazards and elements at risk is relevant and displayed in a GIS system.

B12 Review of the Nice plan communal de sauvegarde according to the metrics

Metric	Poor	Acceptable	Good	Score
Aims and objectives of plans		•		2.5
Target audience and updating		•		2.5
Details of previous floods		•		2
Flood hazard map			•	3
Flood Warning	•			1
Risk to people			•	3
Risk to vulnerable people			•	3
Flood risk to residential properties			•	3
Flood risk to business			•	3
Flood risk to critical infrastructure			•	3
Potential for NaTech hazards	•			1
Evacuation routes	•			1
Shelters/Safe havens	•			1
Relationship with complementary emergency plans		•		1
Communication with other agencies		•		2
Communication with the public	•			1
Managment of the media	•			1
Assumptions made by the plan	•			1
Plan activation		•		2
Actions, roles and responsibilities		•		2
Recovery	•			1
Training and exercises			•	3
			Average	**2.0**

Figure B11 The location of Nice

Review of the Cléry-Saint-André plan communal de sauvegarde

Name of plan	Modèle de gestion de crise inondation de Cléry-Saint-André (Loiret, 45). (elaborated with the software OSIRIS-Inondation v1.4).
Name of geographical area covered by the plan:	Cléry-Saint-André
Date when the plan was produced:	Updated October, 2009.
Approximate area covered by the plan:	18,13 km².
Approximate number of people living in the area covered by the plan.	3 005 Inhabitants (2006). 494 inhabitants within flood zone.
Length of the plan:	613 pages.
Aim of the plan:	To model a the preparedness and the management of a crisis in a « standard » commune
Brief comments:	The plan is quite exhaustive (elements at risk, numerous maps) One of the first PCS built with the software OSIRIS. Quite a prototype.

The commune of Cléry-St-André, is a small commune of 2789 inhabitants on left bank of the Loire at 16 km from the main town Orleans. The village is situated at 3km far from the River Loire in a flat plain crossed by the little river Ardoux. A levee, built in the 12th century, is supposed to protect the village

against the Loire overflowing. A spillage channel had been built through the levees after the 1856 and 1866 floods that triggered a general failure of dike system in the Loire valley. Even if the commune is prone to many other dangers such as transportation of dangerous goods, storms, land subsidence, the floods of the Loire River are the major risk the commune has to face up.
Since 1907, the commune didn't have to undergo any huge flood. That explain why the risk awareness has weakened in the population (Rode, 2009). The last flood occurred in December 2003 but without major damage. The scenario of crisis takes into account a slow-rising flood of Loire worsened by dike failure. The consequences would be huge water depths (till 5 meters) and a long immersion (several days).

The PCS is mainly based on flood risk, but some other risks previously mentioned are addressed. The last version (assessed) was updated in October 2009. The whole document stretches to 613 pages. It has been drawn thanks to the software Osiris (see description of tools). The plan has been elaborated as a model and took advantage of grants to develop the software OSIRIS. Thus, the plan is currently mentioned as an example. It contains many maps of risk to people, risk to properties and main assets. The maps for the management of the crisis are also very accurate.

The commune is divided in different sectors for which all the information necessary for the management of the crisis is described. It could be called the "rolls Royce" of local emergency plans. According to the metrics, the plan is scored 2.4 (above average). This is the best score we met in assessing the sample of plans. In theory, in hard copy and numerical version, the plan of Cléry-Saint-André is very complete and few shortcomings come out. However, we can wonder if the plan would be "operational" in time of crisis. The only reservation is the transmission of know-how and skills acquired during the setting up of this plan. There is little information about the updating of the plan.

Table B13 Review of Cléry-Saint-André plan communal de sauvegarde according to the metrics

Metric	Poor	Acceptable	Good	Score
Aims and objectives of plans	poor			1
Target audience and updating		acceptable		2
Details of previous floods			good	3
Flood hazard map			good	3
Flood Warning			good	3
Risk to people			good	3
Risk to vulnerable people			good	3
Flood risk to residential properties			good	3
Flood risk to business			good	3
Flood risk to critical infrastructure			good	3
Potential for NaTech hazards			good	3
Evacuation routes			good	3
Shelters/Safe havens			good	3
Relationship with complementary emergency plans	poor			1
Communication with other agencies			good	3
Communication with the public			good	3
Managment of the media	poor			1
Assumptions made by the plan	poor			1
Plan activation			good	3

Actions, roles and responsibilities			good	3
Recovery	poor			1
Training and exercises	poor			1
			average	**2.4**

Figure B11 The location of Cléry-Saint-André

Review of Sommières plan communal de sauvegarde

Name of plan	Modèle de gestion de crise inondation de Cléry-Saint-André (Loiret, 45). (elaborated with the software OSIRIS-Inondation v1.4).
Name of geographical area covered by the plan:	Cléry-Saint-André
Date when the plan was produced:	Updated October, 2009.
Approximate area covered by the plan:	18,13 km².
Approximate number of people living in the area covered by the plan.	3 005 Inhabitants (2006). 494 inhabitants within flood zone.
Length of the plan:	613 pages.
Aim of the plan:	To model a the preparedness and the management of a crisis in a « standard » commune
Brief comments:	The plan is quite exhaustive (elements at risk,

	numerous maps) One of the first PCS built with the software OSIRIS. Quite a prototype.

Sommières is a small commune in the South of France (4505 Inhabitants in 2006), in the department of Gard, region Languedoc Roussillon. The commune is concerned with the flash overflows of the Vidourle River, a 800 km^2 catchments tributary of the Mediterranean sea.The majority of the commune is strongly exposed to the "vidourlades", floods recurring of the low points of the city built mainly in the bed of flood of the river. The growing urbanization since the Middle Age increased the elements at risk as the city was built first new the River for economical and military reasons. Till 1990's many building were set up in the flood zone such as the police station, a school and the fireman station as if the risk we completely ignored. However, huge floods are rather frequent: historical testimonies mention 4 major flooding within last 100 years: 1907, 1933, 1958 and the last one in September 2002.
The PCS is for now only dedicated to floods (updated in April 2009) It is organised according three levels of emergency (yellow, orange, red) depending on the water depth in the street of the communes. A page of the website of the commune is especially dedicated to the Vidourle River.

Action cards and resources forms help to state the different responsibilities in case of emergency. Training and exercises are not considered as necessary owing to the frequency rising of Vidourle River. The first level of alert is launched at least 2 or 3 times a year.
According to the metrics, the PCS of Sommières is « above average » with 2.44. Despite the shortage of mapping of economical assets, flood processes and elements at risk are well known by the authorities. We can actually wonder about the transmission of this knowledge in the future when the team who drew the PCS won't be in responsibilities anymore.

Table B14 Review of Sommières plan communal de sauvegarde according to the metrics

Metric	•	Acceptable	Good	Score
Aims and objectives of plans	•			1
Target audience and updating		•		2
Details of previous floods	•			1
Flood hazard map			•	3
Flood Warning			•	3
Risk to people	•			1
Risk to vulnerable people	•			1
Flood risk to residential properties	•			1
Flood risk to business	•			1
Flood risk to critical infrastructure		•		2
Potential for NaTech hazards			•	3
Evacuation routes		•		2
Shelters/Safe havens	•			1
Relationship with complementary emergency plans		•		
Communication with other agencies			•	3
Communication with the public			•	3
Managment of the media			•	3
Assumptions made by the plan	•			1
Plan activation			•	3
Actions, roles and responsibilities			•	3

Recovery			•	3
Training and exercises			•	3
			Average	**2**

Figure B12 The location of Sommières

Review of the Nancy plan communal de sauvegarde according to the metrics

Name of plan	Plan Communal de Sauvegarde of the city of Nancy.
Name of geographical area covered by the plan:	City of Nancy.
Date when the plan was produced:	May, 2009.
Approximate area covered by the plan:	15,01 km².
Approximate number of people living in the area covered by the plan.	105 349 inhabitants (2007).
Length of the plan:	49 pages.
Aim of the plan:	The aim is to develop the preventive information.
Brief comments:	The document is made of three parts : - The DICRIM (under the form of questions/answers that improve the understanding (more didactic)), - The information to the population in case of

	crisis - The resources of the commune to handle a crisis.

Nancy is a city of the North-Eastern France. It is the prefecture of the department of Meurthe-et-Moselle (Lorraine metropolitan region). The commune had a total population of 105, 349 in 2007. The Town of Nancy is prone to 6 major risks listed in the DICRIM: flood, landslide, dam failure, explosion of grain storage silo, transportation of dangerous goods, risk due to old mines (subsidence).

The commune is located at the bottom of a small valley where runs the River Meurthe which generated floods in 1947 (the highest flood ever known) and in December 1982 and six months after in April and May 1983 April.

The last version of the plan has been released in 2009. The score of this plan according to the metrics is rather low (1.4 i.e. room for improvement). This low score can be explained by the shortage of risk assessment maps (risk to people, risk to economical assets…). The link between technological dangers and natural hazards is not addressed. The plan only refers to a map of shelters and safe heavens. The plan is recent and the municipal authorities are eager to improve some shortcomings.

Table B15 Review of the Nancy plan communal de sauvegarde according to the metrics

Metric	Poor	Acceptable	Good	Score
Aims and objectives of plans		•		2
Target audience and updating		•		2
Details of previous floods		•		2
Flood hazard map		•		2.5
Flood Warning	•			1
Risk to people	•			1
Risk to vulnerable people	•			1
Flood risk to residential properties	•			1
Flood risk to business	•			1
Flood risk to critical infrastructure	•			1
Potential for NaTech hazards	•			1
Evacuation routes	•			1
Shelters/Safe havens		•		2
Relationship with complementary emergency plans	•			1
Communication with other agencies	•			1
Communication with the public		•		2
Managment of the media		•		2
Assumptions made by the plan	•			1
Plan activation	•			1
Actions, roles and responsibilities		•		2
Recovery	•			1
Training and exercises	•			1

			Average	**1.4**

Figure B13 The location of Nancy

Review of the Saint-Raphael plan communal de sauvegarde

Name of plan	Plan Communal de Sauvegarde - Manuel opérationnel et information du public.
Name of geographical area covered by the plan:	City of Saint-Raphaël.
Date when the plan was produced:	2009.
Approximate area covered by the plan:	89,59 km².
Approximate number of people living in the area covered by the plan.	34 425 inhabitants (01/01/2009) but up to 92 500 people in summer (tourists)
Length of the plan:	142 pages.
Aim of the plan:	Give information to people and set up the operational organization.
Brief comments:	It is composed of three parts: Section description, section operational and section information (DICRIM). PCS takes into account the touristic activity (that is very important in this case). Different hazards are detailed in specific sheets.

Saint-Raphael is a Commune of the department Var in Mediterranean southern part of France and had an estimated population of 34, 425 habitants (January 2009). The city can be exposed to several technological and natural dangers such as forest fire, earthquake, landslide, bad weather conditions and dam failure, sea contamination and transportation of dangerous goods. Concerning flood risk the communes is proneto the overflowing of small catchments (Garonne, Agay…) and by pluvial runoff. The hydrological response is very quick after intense rainfalls in autumn.
The PCS that we assessed is dated 2009 and available on line with the DICRIM. The document refers to a previous « flood emergency plan in the commune" without giving more details. The PCS of Saint-Raphaël is drawn as an operational handbook organised by hazards with links to actions to implement for each hazard.

The plan is badly scored according to the metrics (1.5) i.e. « room for improvement ». The « bad » score of the plan can be explained by the shortage of maps. Only two maps (bad quality) shows the flood prone zone and flood to public buildings. The catchments prone to floods neither are mentioned in the DICRIM. We remind that the DICRIM is a document actually included in the PCS and which deals with the information to the population on major risks existing in the commune.

Table B16 Review of the Saint-Raphaël plan communal de sauvegarde according to the metrics

Metric	Poor	Acceptable	Good	Score
Aims and objectives of plans	•			1
Target audience and updating		•		2
Details of previous floods	•			1
Flood hazard map		•		2
Flood Warning	•			1
Risk to people	•			1
Risk to vulnerable people	•			1
Flood risk to residential properties	•			1
Flood risk to business	•			1
Flood risk to critical infrastructure	•			1
Potential for NaTech hazards	•			1
Evacuation routes	•			1
Shelters/Safe havens	•			
Relationship with complementary emergency plans			•	3
Communication with other agencies			•	3
Communication with the public		•		2
Managment of the media		•		2
Assumptions made by the plan	•			1
Plan activation		•		2
Actions, roles and responsibilities		•		2
Recovery		•		1.5
Training and exercises		•		1.5
			Average	**1.5**

Figure B14 The location of Saint-Raphael

Review of Piolenc plan communal de sauvegarde

Name of plan	Plan Communal of Piolenc.
Name of geographical area covered by the plan:	City of Piolenc.
Date when the plan was produced:	April, 2009.
Approximate area covered by the plan:	24.8 km².
Approximate number of people living in the area covered by the plan.	4 495 inhabitants in 2006.
Length of the plan:	122 pages.
Aim of the plan:	This plan aims to define the first steps to implement by the mayor, in order to protect people and property, and in waiting the triggering of the departmental plan.
Brief comments:	This is a multi-risk plan. The plan seems to have been quickly drawn up. Many cards and sheets are directly extracted from national guidelines. Several mistakes appear such as PSC instead of PCS p.13. The plan is redundant: the warning plan comes out three times (16, 27, 28). Moreover, these repetitions are not in similar terms. It is the same for the safety instructions that appear several

	times without being the same. Several pages are dedicated to H1N1 influenza.

The commune of Piolenc is situated in the southern France in the department of “Vaucluse” in the region “provence Alpes-Côte-d’Azur”. 4495 inhabitants lived in the communes in 2006. The commune is prone to the flood of Rhone River and the floods of Aygues River. The Rhone River floods are slow rising flood but they spread over a large low plain and can trigger many damages especially on industrial and nuclear plants. The Aygues and Rieu du Foyro rivers run down from the surrounding hills and trigger flash floods in autumn (September to December).

What arises from the PCS of Piolenc is that it seems to have been made in urgency in April 2009. Most of the sheets compiled in the PCS are copies (“copy and paste”) of generic files stated in different guidelines by states services (ministry, prefecture). The average note is rather low because even if the PCS stretches to 122 p., few of them concerns flood risk. Many risks are addressed: technological and nuclear risk including influenza epidemic. We suppose that the commune was compelled to respect legal demand and drew a first draft.

Table B17 Review of the PCS of Piolenc according the metrics

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans	●			1
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map		●		2.5
Flood Warning	●			1
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards			●	3
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies	●			1
Communication with the public		●		2
Managment of the media	●			1
Assumptions made by the plan		●		2
Plan activation	●			1
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises	●			1
			Average	**1.4**

Figure B15 The location of Piolenc

Appendix C Details of the review of Multi-Agency Floodplains in the Netherlands

Introduction
A few Safety Regions were unwilling to hand over their plan due to the fact that these plans were too much of a draft version to be handed over to a third party. Eleven regions provided draft plans that were of high enough quality to be used in this research. To protect the privacy of the participating regions, it was decided to compare the plans anonymously. The names of the plans are therefore replaced by numbers. Table C1 provides brief details of the plans that were available to the project by the end of January 2010 and that were analysed using the developed metrics.

The following assumptions were made when using the metrics in the Netherlands:

- If a metric was qualified in between for instance poor and acceptable, it was qualified as poor;
- If a metric was not mentioned at all in the plan, it was qualified as poor;
- A detailed scenario analysis was assumed to be covered by the metric 'Aims and objectives of the plan';
- If for a certain metric the plan referred to another plan or document, the metric was qualified as acceptable.

Table C1 List of flood emergency plans reviewed for the Netherlands

Name of plan	Type of plan	Date of plan	Length of plan (pages)	Score
Plan 1	Safety Region plan	Version 1.0, 5th of June 2007	286	2.3
Plan 2	Safety Region plan	March 26, 2009	76	1.8
Plan 3	Safety Region plan	May 2009	109	1.6
Plan 4	Safety Region plan	Version 1.0, 3rd of December 2008	88	2.2
Plan 5	Safety Region plan	Version 3.0, November 2009 (draft)	54	1.7
Plan 6	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	15th of September, 2005	188	1.8
Plan 7	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	Version 1.1, 14th of August, 2007	41	1.2
Plan 8	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	Version 2, 1st of October 2007	31	1.5
Plan 9	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	Version 2.3, December 2009 (draft)	36	1.4
Plan 10	Regional plan constructed by multiple parties (municipalities, Water Boards, etc.)	August 2008 (draft)	55	1.6
Plan 11	Safety Region plan	Februari 2010 (draft)	57	1.6
National response plan	National Response Plan	August 2008	157	1.6

Review of Plan 1
This plan focuses on disaster caused by river floods. The area covered by this plan includes several larger cities, in the order of magnitude of several hundreds of thousands each. Also, the area has a high economical value. The plan was produced in June 2007. It is 286 pages in length and generally quite specific. It could improve on information about flood risk, recovery, and details of previous floods. Most metrics scored high however, resulting in a score well above average. A lay-out was used that is used by some other official plans.

Table C2 Review of Plan 1

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods	●			1
Flood hazard map			●	3
Flood Warning			●	3
Risk to people			●	3
Risk to vulnerable people		●		2
Flood risk to residential properties	●			1
Flood risk to business			●	3
Flood risk to critical infrastructure			●	3
Potential for NaTech hazards		●		2
Evacuation routes			●	3
Shelters/Safe havens		●		2
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan		●		2
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery	●			1
Training and exercises		●		2
			Average score	2.3
			Rating	"Above average"

Review of Plan 2

This plan focuses on disaster caused by lake floods. The area covered by this plan includes several smaller cities (below 100,000 inhabitants), but is not very large. The plan was produced in March 2009. It is 76 pages in length and generally not very specific, but acceptable. A lay-out was used that is used by some other official plans. The plan could be improved on details of most metrics. One way in which the plan could be improved is by the addition of additional maps and figures at a suitable scale.

Table C3 Review of Plan 2

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map			●	3
Flood Warning		●		2
Risk to people		●		2
Risk to vulnerable people	●			1
Flood risk to residential properties		●		2
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards		●		2
Evacuation routes		●		2
Shelters/Safe havens		●		2
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan		●		2
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises		●		2
			Average score	1.8
			Rating	"Below average"

Review of Plan 3

This plan focuses on disaster caused by sea and lake floods. The area covered by this plan includes some cities (below and above 100,000 inhabitants), and is quite large. However, it should be noted that in general, this region is not very densely populated. Also, we know that it is probably assumed that most cities in this region are not very likely to flood. The plan was produced in May 2009. It is 109 pages in length and generally not very specific. Risks are usually not specified, and evacuation routes and shelters are not defined. Also recovery is not mentioned in detail. This results in a score below average. The plan could be improved on most metrics. One way in which this could be done is by the addition of more detailed information, maps and figures at a suitable scale.

Table C4 Review of Plan 3

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map			●	3
Flood Warning	●			1
Risk to people		●		2
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans	●			1
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media	●			1
Assumptions made by the plan			●	3
Plan activation			●	3
Actions, roles and responsibilities			●	3
Recovery	●			1
Training and exercises	●			1
			Average score	1.6
			Rating	"Below average"

Review of Plan 4

This plan focuses on disaster caused by river floods. The area covered by this plan includes a considerable number of cities (below and above 100,000 inhabitants), and is quite large. The plan was produced in December 2008. It is 88 pages in length and generally quite specific, resulting in an above average score. A lay-out was used that is used by some other official plans. The plan could be improved on some metrics. One way in which this could be done is by a better definition of risk, a better defined relationship with other plans and on details of previous floods.

Table C5 Review of Plan 4

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating			●	3
Details of previous floods	●			1
Flood hazard map			●	3
Flood Warning		●		2
Risk to people			●	3
Risk to vulnerable people		●		2
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure			●	3
Potential for NaTech hazards		●		2
Evacuation routes			●	3
Shelters/Safe havens		●		2
Relationship with complementary emergency plans	●			1
Communication with other agencies			●	3
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan			●	3
Plan activation			●	3
Actions, roles and responsibilities		●		2
Recovery		●		2
Training and exercises		●		2
			Average score	2.2
			Rating	"Above average"

Review of Plan 5

This plan focuses on disaster caused by river and sea floods. The area covered by this plan includes a considerable number of cities (below and above 100,000 inhabitants), and is quite large. The plan was produced in November 2009, and it is a draft version. This fact should be taken into consideration when looking at its score. It is 54 pages in length and generally not very specific, resulting in a score below average. The plan could be improved on many metrics. One way in which this could be done is by defining risk better. Also, the plan could be improved by adding maps and figures at a suitable scale.

Table C6 Review of Plan 5

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map			●	3
Flood Warning		●		2
Risk to people		●		2
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public			●	3
Management of the media		●		2
Assumptions made by the plan		●		2
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises		●		2
			Average score	1.7
			Rating	"Below average"

Review of Plan 6

This plan focuses on disaster caused by sea floods. The area covered by this plan includes a number of cities (below and above 100,000 inhabitants), and is quite large. However, quite some parts of the region are not very densely populated. Also, we know that it is probably assumed that most parts of this region are not very likely to flood. The plan was produced in September 2005, and it is not sure if this plan is an official safety region document. It includes the plans of several sub-regions, and in total the plan is 188 pages in length. The plan is generally not very specific, with many references to information to be found in other plans. This results in a score below (but close to) average. The plan could be improved on many metrics, basically by providing more detail in the plan itself. This could be done by adding maps and figures at a suitable scale.

Table C7 Review of Plan 6

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating	●			1
Details of previous floods	●			1
Flood hazard map		●		2
Flood Warning		●		2
Risk to people		●		2
Risk to vulnerable people		●		2
Flood risk to residential properties		●		2
Flood risk to business	●			1
Flood risk to critical infrastructure		●		2
Potential for NaTech hazards		●		2
Evacuation routes		●		2
Shelters/Safe havens		●		2
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises	●			1
			Average score	1.8
			Rating	"Below average"

Review of Plan 7

This plan focuses on disaster caused by sea floods. The area covered by this plan includes a number of cities (below and above 100,000 inhabitants), and is quite large. The plan was produced in August 2007, and it is a regional plan constructed by multiple parties (municipalities, waterboards, etc.). The plan is 41 pages in length. The plan is generally not specific at all. This results in a low score, close to 1. The plan could be improved on almost every metric, basically by providing more detail in the plan itself. This could be done by adding maps and figures at a suitable scale and defining risk better.

Table C8 Review of Plan 7

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating	●			1
Details of previous floods	●			1
Flood hazard map	●			1
Flood Warning		●		2
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans	●			1
Communication with other agencies	●			1
Communication with the public		●		2
Management of the media	●			1
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises	●			1
			Average score	1.2
			Rating	"Below average"

Review of Plan 8

This plan focuses on disaster caused by river floods. The area covered by this plan includes a number of cities (below and above 100,000 inhabitants), but is not very densely populated. The plan was produced in October 2007, and it is a regional plan constructed by multiple parties (municipalities, waterboards, etc.). The plan is 31 pages in length. The plan is generally not specific, which results in a score below average. The plan could be improved on almost every metric, basically by providing more detail in the plan. This could be done by adding maps and figures at a suitable scale, by defining risk better and by providing more detail on recovery.

Table C9 Review of Plan 8

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map	●			1
Flood Warning		●		2
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans	●			1
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises		●		2
			Average score	1.5
			Rating	"Below average"

Review of Plan 9

This plan focuses on disaster caused by river floods. The area covered by this plan includes a number of cities (below and above 100,000 inhabitants), but is not very densely populated. The plan (which is a draft version) was produced in December 2009, and it is a regional plan constructed by multiple parties (municipalities, Water Boards, etc.). The plan is 36 pages in length. The plan is generally not specific, which results in a score below average. The plan could be improved on almost every metric, basically by providing more detail in the plan. This could be done by adding maps and figures at a suitable scale, by defining risk better and by providing more detail on recovery.

Table C10 Review of Plan 9

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans	●			1
Target audience and updating	●			1
Details of previous floods		●		2
Flood hazard map	●			1
Flood Warning		●		2
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans	●			1
Communication with other agencies				
Communication with the public		●		2
Management of the media		●		2
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises		●		2
			Average score	1.4
			Rating	"Below average"

Review of Plan 10

This plan focuses on disaster caused by sea floods. The area covered by this plan is not very densely populated, but includes some cities. The plan (which is a draft version) was produced in August 2008, and it is a regional plan constructed by multiple parties (municipalities, waterboards, etc.). The plan is 55 pages in length. The plan is generally not very specific, which results in a score below average. The plan could be improved by providing more detail in the plan. This could be done by adding maps and figures at a suitable scale, by defining risk better and by providing more detail on training and recovery.

Table C11 Review of Plan 10

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map			●	3
Flood Warning		●		2
Risk to people		●		2
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes		●		2
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies		●		2
Communication with the public		●		2
Management of the media	●			1
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises	●			1
			Average score	1.6
			Rating	"Below average"

Review of Plan 11

This plan focuses on disaster caused by sea and river floods. The area covered by this plan is very densely populated, and includes some large cities. The plan (which is a draft version) was produced in February 2010, and it is a safety region plan. The plan is 57 pages in length. The plan is generally not very specific, which results in a score below average. The plan could be improved by providing more detail. This could be done by adding maps and figures at a suitable scale, by defining risk better and by providing more detail on training and recovery.

Table C12 Review of Plan 11

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans			●	3
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map			●	3
Flood Warning	●			1
Risk to people		●		2
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes			●	3
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies			●	3
Communication with the public		●		2
Management of the media	●			1
Assumptions made by the plan	●			1
Plan activation		●		2
Actions, roles and responsibilities		●		2
Recovery	●			1
Training and exercises	●			1
			Average score	1.6
			Rating	"Below average"

Review of National Response Plan

The national plan does not score very high. This is mainly caused by the fact that this plan focuses on the organization, responsibilities, duties and authorities of the different institutes and officials. As can be seen in the table, the scores for metrics concerning these topics are quite high. It is reasonable that this plan does not include all different flood hazards or all safe havens present in the whole country. This level of preparedness is the responsibility of the safety regions.

Table C13 Review of National Plan

Metric	Room for improvement	Acceptable	Good	Score
Aims and objectives of plans		●		2
Target audience and updating		●		2
Details of previous floods	●			1
Flood hazard map	●			1
Flood Warning	●			1
Risk to people	●			1
Risk to vulnerable people	●			1
Flood risk to residential properties	●			1
Flood risk to business	●			1
Flood risk to critical infrastructure	●			1
Potential for NaTech hazards	●			1
Evacuation routes	●			1
Shelters/Safe havens	●			1
Relationship with complementary emergency plans		●		2
Communication with other agencies			●	3
Communication with the public			●	3
Management of the media		●		2
Assumptions made by the plan		●		2
Plan activation		●		2
Actions, roles and responsibilities			●	3
Recovery	●			1
Training and exercises	●			1
			Average score	1.6
			Rating	“Below average”

Appendix D Independent validation of metrics

Introduction
England and Wales

Two plans were reviewed independently for England and Wales. These were:

Cumbria Multi-Agency Flood Plan
Suffolk Multi Agency Flood Plan

The results of the exercise are summarized in Table D1.

Table D1 Summary of independent review of plans using metrics in England and Wales

Name of plan	Original average score	Independent reviewer average score	Difference in metric scores between reviewer and original		
			Higher scores	Lower scores	Same scores
Cumbria Multi-Agency Flood Plan	2.2	1.9	1	9	12
Suffolk Multi Agency Flood Plan	1.5	1.7	6	0	16

The original average review for the Cumbria MAFP was 2.25 which meant it just fell into the "Good" category. Using the independent reviewer average score it would be reclassified as an "Average" plan. The Suffolk MAFP was classified as a plan with "Room for improvement" using the independent reviewer's score this remains the case, albeit that the average plan score given by the reviewer was 1.7 compared to 1.5.

France

Two plans were reviewed independently for France. These were:

- Piolenc PCS
- Quissac PCS

The results of the exercise are summarized in Table D2.

Table D2 Summary of independent review of plans using the metrics in France

Name of plan	Original average score	Independent reviewer average score	Difference in metric scores between reviewer and original		
			Higher scores	Lower scores	Same scores
Piolenc PCS	1.4	1.4	4	6	12
Quissac PCS	2.2	2.4	7	2	13

The original average review for the Quissac PCS was 2.20 which meant it just fell into the "Good" category. Using the independent reviewer average score of 2.4 it would still be classified as "Good". The Piolenc PCS was classified as a plan with "Room for improvement" using the reviewer score this remains the case.

D3 The Netherlands

Two plans were reviewed. These were:

- Plan 4
- Plan 9

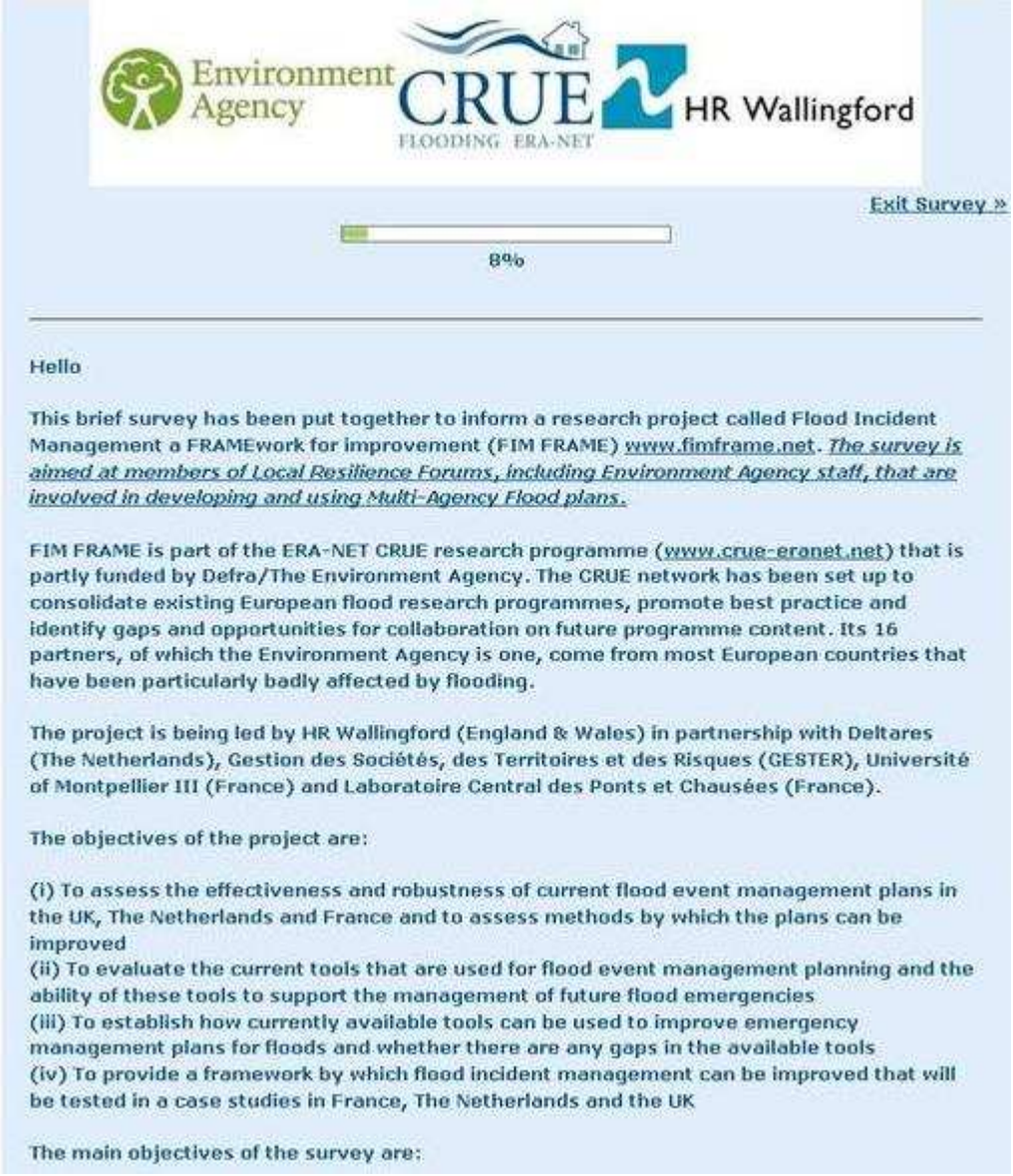
The results of the exercise are summarized in Table D3.

Table D3 Summary of independent review of plans using the metrics in France

Name of plan	Original average score	Independent reviewer average score	Difference in metric scores between reviewer and original		
			Higher scores	Lower scores	Same scores
Plan 4	2.3	2.3	3	3	16
Plan 9	1.3	1.5	4	2	16

The original average review for Plan 4 was 2.33 which meant it fell into the "Above average" category. The independent reviewer scored the same value, although the metrics were not all scored similar. Plan 9 was classified as a plan with "Considerable room for improvement". The reviewer scored a 1.50 which is classes as "Room for improvement".

Appendix E Online survey carried out in England and Wales



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8%

Hello

This brief survey has been put together to inform a research project called Flood Incident Management a FRAMEwork for improvement (FIM FRAME) www.fimframe.net. *The survey is aimed at members of Local Resilience Forums, including Environment Agency staff, that are involved in developing and using Multi-Agency Flood plans.*

FIM FRAME is part of the ERA-NET CRUE research programme (www.crue-eranet.net) that is partly funded by Defra/The Environment Agency. The CRUE network has been set up to consolidate existing European flood research programmes, promote best practice and identify gaps and opportunities for collaboration on future programme content. Its 16 partners, of which the Environment Agency is one, come from most European countries that have been particularly badly affected by flooding.

The project is being led by HR Wallingford (England & Wales) in partnership with Deltares (The Netherlands), Gestion des Sociétés, des Territoires et des Risques (GESTER), Université of Montpellier III (France) and Laboratoire Central des Ponts et Chausées (France).

The objectives of the project are:

(i) To assess the effectiveness and robustness of current flood event management plans in the UK, The Netherlands and France and to assess methods by which the plans can be improved
(ii) To evaluate the current tools that are used for flood event management planning and the ability of these tools to support the management of future flood emergencies
(iii) To establish how currently available tools can be used to improve emergency management plans for floods and whether there are any gaps in the available tools
(iv) To provide a framework by which flood incident management can be improved that will be tested in a case studies in France, The Netherlands and the UK

The main objectives of the survey are:

The objectives of the project are:

(i) To assess the effectiveness and robustness of current flood event management plans in the UK, The Netherlands and France and to assess methods by which the plans can be improved
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(iii) To establish how currently available tools can be used to improve emergency management plans for floods and whether there are any gaps in the available tools
(iv) To provide a framework by which flood incident management can be improved that will be tested in a case studies in France, The Netherlands and the UK

The main objectives of the survey are:

(i) To understand what information is of assistance to emergency planners in assisting them with the formulation of Multi Agency Flood Plans
(ii) To understand what tools (e.g. methods, guidelines, software etc), if any, could be developed to assist with the development of Multi Agency Flood Plans

Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important for us to learn your opinions.

Your survey responses will be strictly confidential and data from this research will be reported only in the aggregate. Your information will be coded and will remain confidential. If you have questions at any time about the survey or the procedures, you may contact Darren Lumbroso by email at d.lumbroso@hrwallingford.co.uk.

It should take no more than 10 minutes to complete the questionnaire.

Thank you very much for your time and support. Please start with the survey now by clicking on the Continue button below.

Continue

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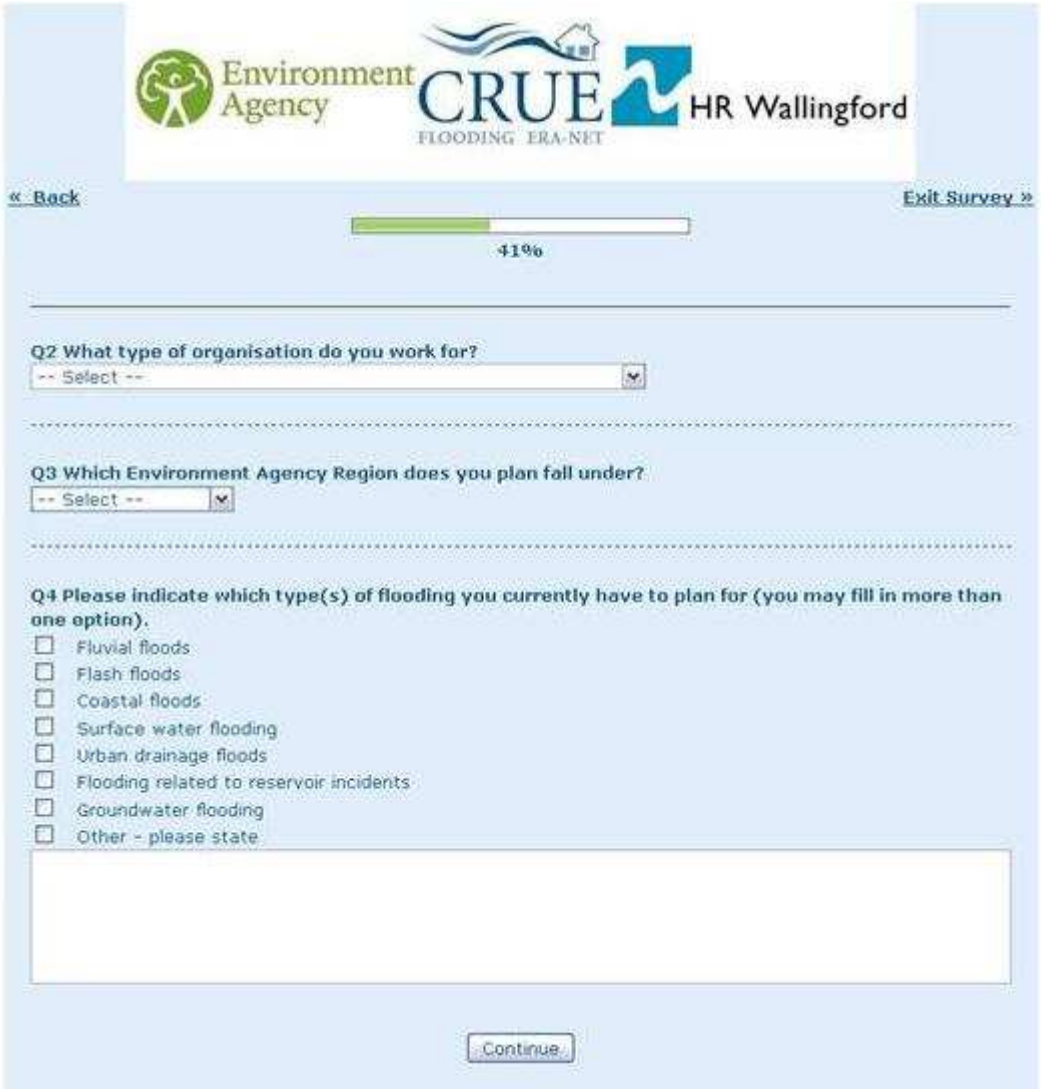
Q1 Are you currently responsible or involved with preparing Multi Agency Flood Plans?

- Yes
- No
- Don't know

Continue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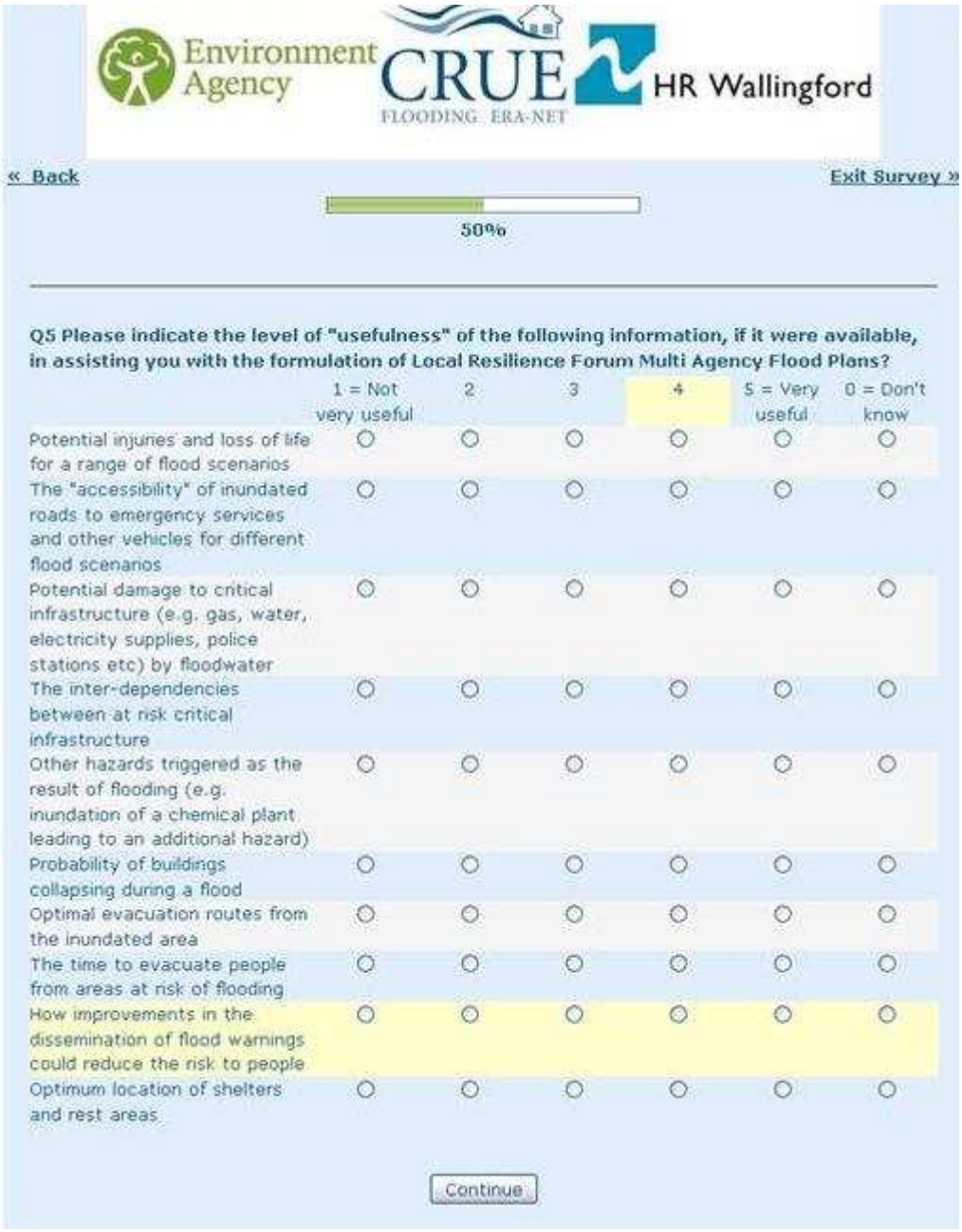
41%
Q2 What type of organisation do you work for?
-- Select --
Q3 Which Environment Agency Region does you plan fall under?
-- Select --
Q4 Please indicate which type(s) of flooding you currently have to plan for (you may fill in more than one option).
Fluvial floods
Flash floods
Coastal floods
Surface water flooding
Urban drainage floods
Flooding related to reservoir incidents
Groundwater flooding
Other - please state
Continue



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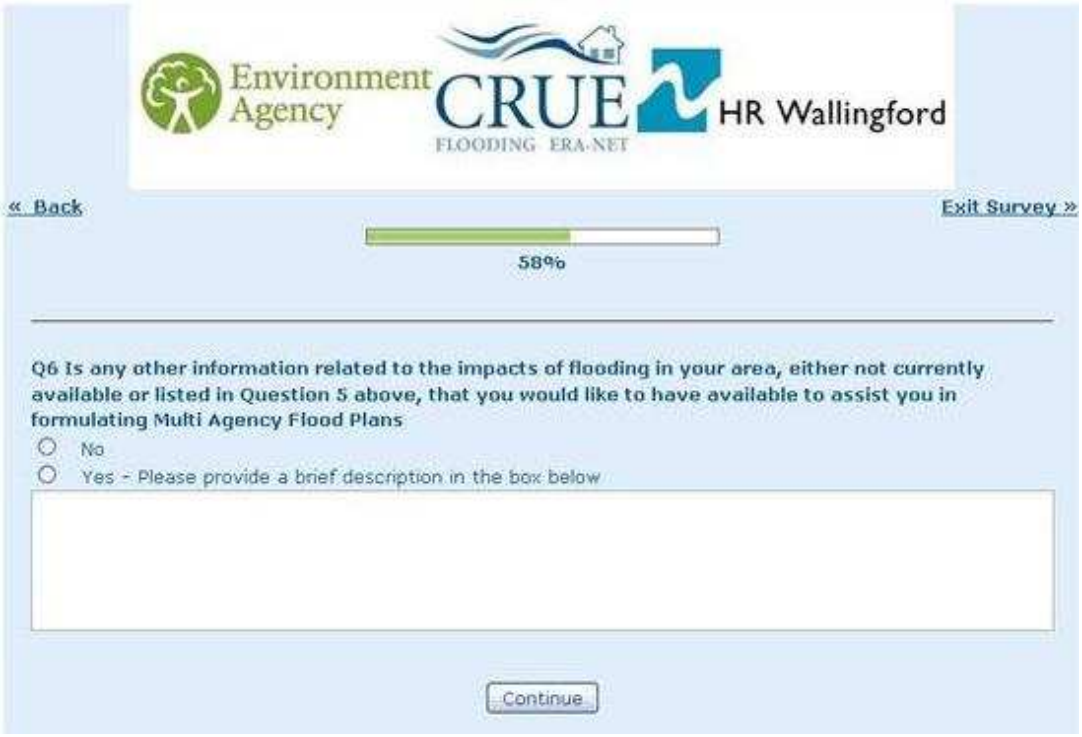
50%

Q5 Please indicate the level of "usefulness" of the following information, if it were available, in assisting you with the formulation of Local Resilience Forum Multi Agency Flood Plans?

	1 = Not very useful	2	3	4	5 = Very useful	0 = Don't know
Potential injuries and loss of life for a range of flood scenarios	○	○	○	○	○	○
The "accessibility" of inundated roads to emergency services and other vehicles for different flood scenarios	○	○	○	○	○	○
Potential damage to critical infrastructure (e.g. gas, water, electricity supplies, police stations etc) by floodwater	○	○	○	○	○	○
The inter-dependencies between at risk critical infrastructure	○	○	○	○	○	○
Other hazards triggered as the result of flooding (e.g. inundation of a chemical plant leading to an additional hazard)	○	○	○	○	○	○
Probability of buildings collapsing during a flood	○	○	○	○	○	○
Optimal evacuation routes from the inundated area	○	○	○	○	○	○
The time to evacuate people from areas at risk of flooding	○	○	○	○	○	○
How improvements in the dissemination of flood warnings could reduce the risk to people	○	○	○	○	○	○
Optimum location of shelters and rest areas	○	○	○	○	○	○

Continue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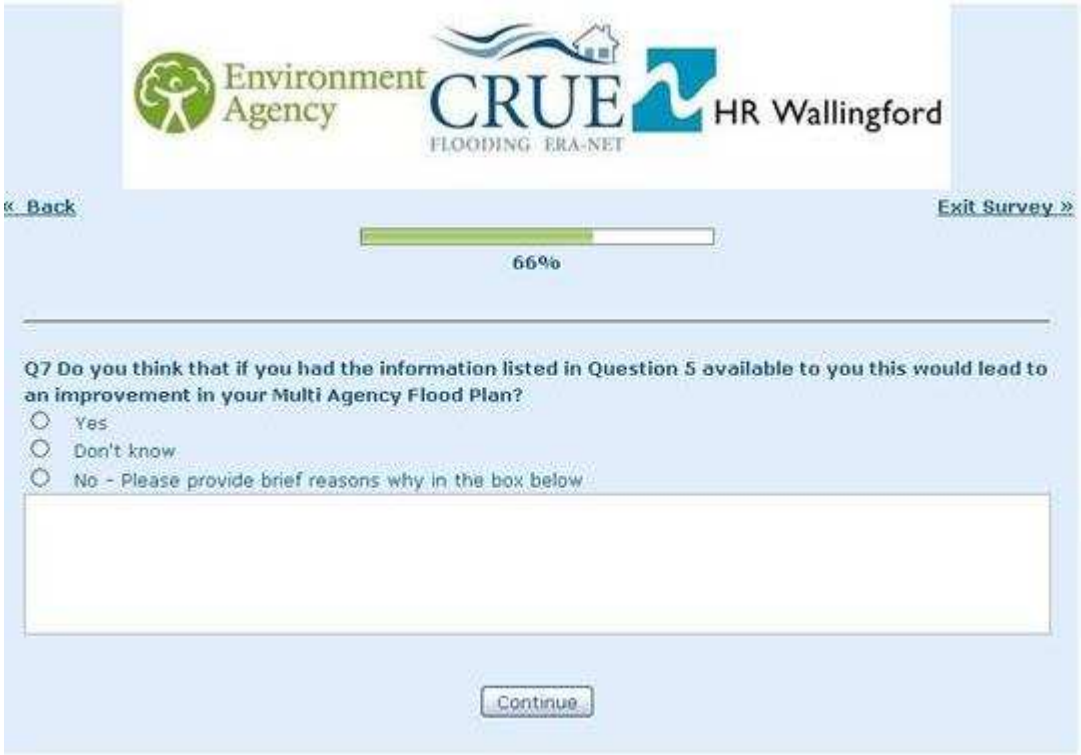
58%
Q6 Is any other information related to the impacts of flooding in your area, either not currently available or listed in Question 5 above, that you would like to have available to assist you in formulating Multi Agency Flood Plans
No
Yes - Please provide a brief description in the box below
Continue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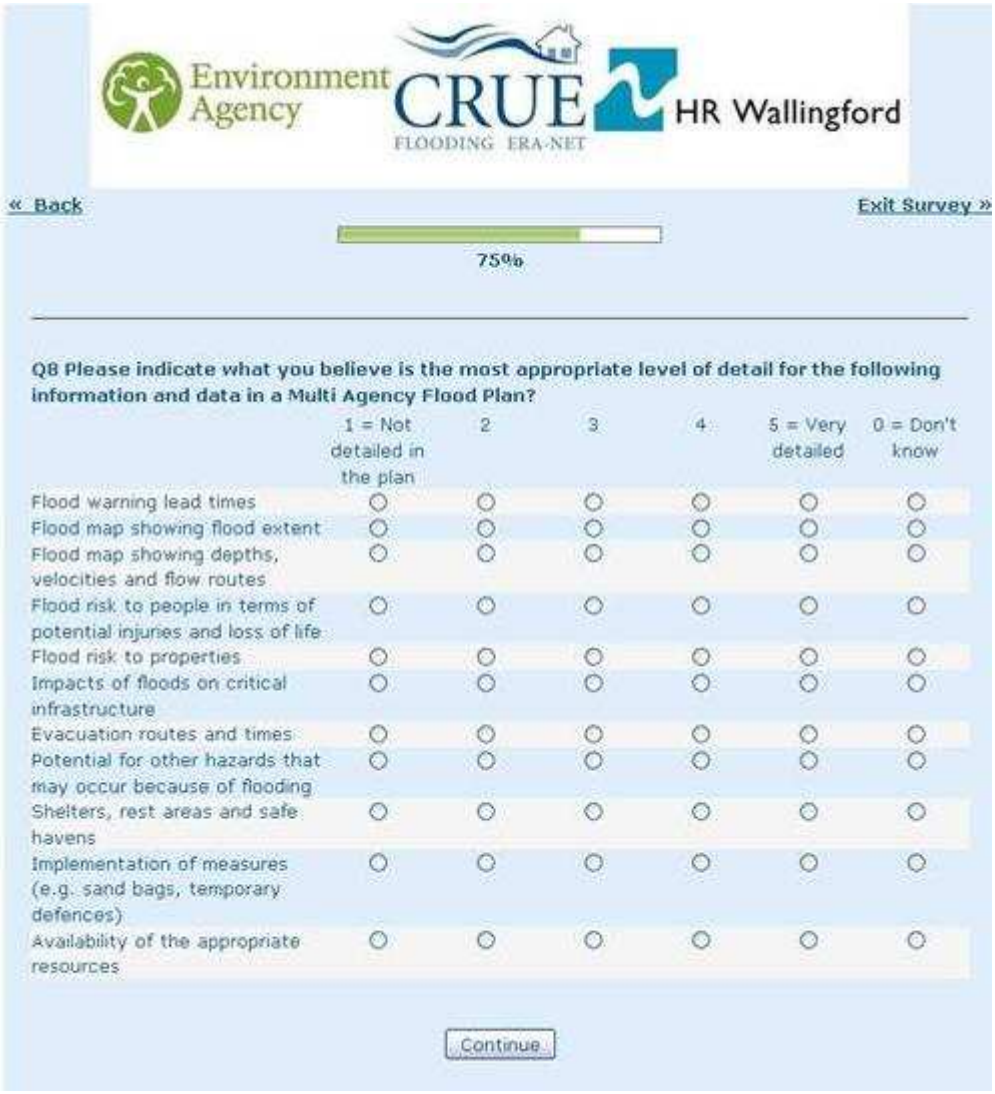
66%
Q7 Do you think that if you had the information listed in Question 5 available to you this would lead to an improvement in your Multi Agency Flood Plan?
Yes
Don't know
No - Please provide brief reasons why in the box below
Continue



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75%

Q8 Please indicate what you believe is the most appropriate level of detail for the following information and data in a Multi Agency Flood Plan?

	1 = Not detailed in the plan	2	3	4	5 = Very detailed	0 = Don't know
Flood warning lead times	○	○	○	○	○	○
Flood map showing flood extent	○	○	○	○	○	○
Flood map showing depths, velocities and flow routes	○	○	○	○	○	○
Flood risk to people in terms of potential injuries and loss of life	○	○	○	○	○	○
Flood risk to properties	○	○	○	○	○	○
Impacts of floods on critical infrastructure	○	○	○	○	○	○
Evacuation routes and times	○	○	○	○	○	○
Potential for other hazards that may occur because of flooding	○	○	○	○	○	○
Shelters, rest areas and safe havens	○	○	○	○	○	○
Implementation of measures (e.g. sand bags, temporary defences)	○	○	○	○	○	○
Availability of the appropriate resources	○	○	○	○	○	○

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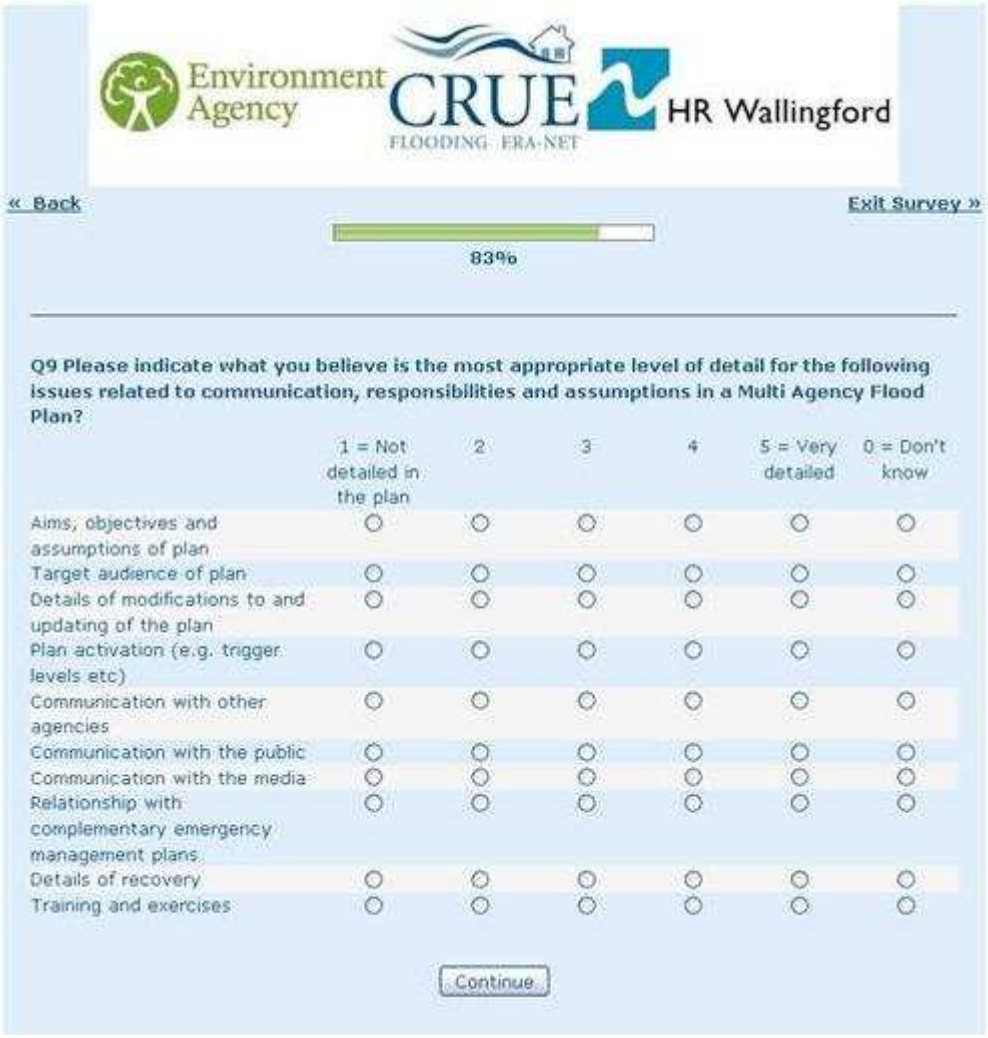

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83%

Q9 Please indicate what you believe is the most appropriate level of detail for the following issues related to communication, responsibilities and assumptions in a Multi Agency Flood Plan?

	1 = Not detailed in the plan	2	3	4	5 = Very detailed	0 = Don't know
Aims, objectives and assumptions of plan	○	○	○	○	○	○
Target audience of plan	○	○	○	○	○	○
Details of modifications to and updating of the plan	○	○	○	○	○	○
Plan activation (e.g. trigger levels etc)	○	○	○	○	○	○
Communication with other agencies	○	○	○	○	○	○
Communication with the public	○	○	○	○	○	○
Communication with the media	○	○	○	○	○	○
Relationship with complementary emergency management plans	○	○	○	○	○	○
Details of recovery	○	○	○	○	○	○
Training and exercises	○	○	○	○	○	○

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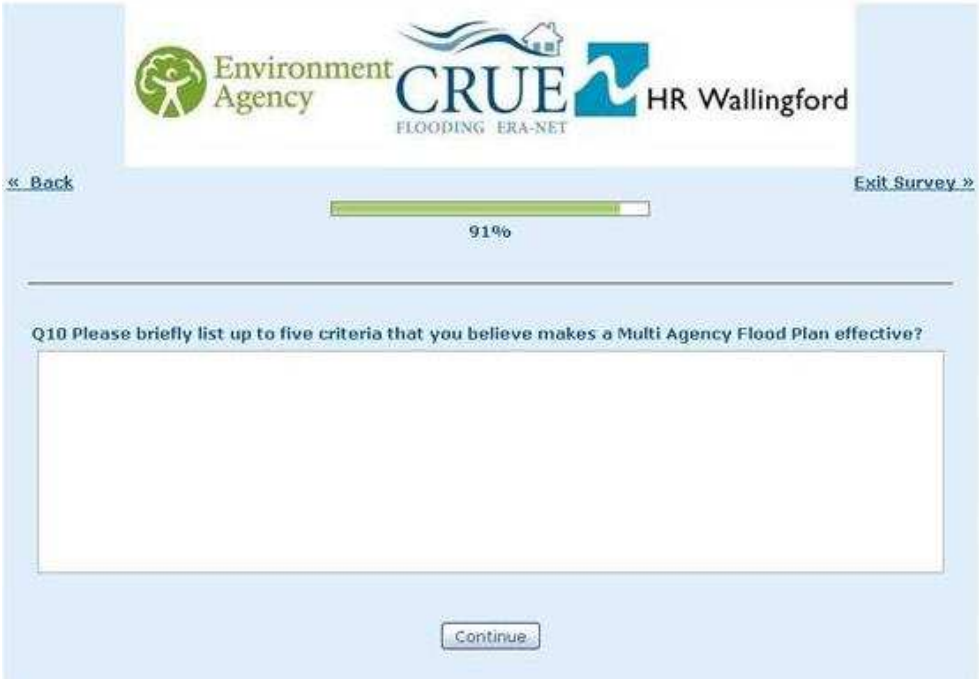
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91%
Q10 Please briefly list up to five criteria that you believe makes a Multi Agency Flood Plan effective?
Continue


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100%
Q11 If you have any further comments that you wish to make about tools, methods or guidance that you believe could contribute to improving Multi Agency Flood Plans please add them to the box below.
Continue
Thank you for your time. The final project reports will be available from the project web site www.fimframe.net in 2011. However, interim results of the survey should be available to download from the FIM FRAME web site by May 2010. If you would like any further information please contact the project coordinator Darren Lumbroso by email at d.lumbroso@hrwallingford.co.uk.
Thank you for completing this survey

Appendix F Online survey carried out in France

Exit Survey »

8%

Bonjour,

Ce questionnaire a été réalisé afin de renseigner un projet de recherche européen intitulé «*Flood Incident Management, a FRAMEwork for improvement (FIM FRAME)*» www.fimframe.net. Ce projet fait partie du programme de recherche ERA-NET CRUE (www.crue-eranet.net), soutenu par le MEEDDM et plusieurs partenaires étrangers (Angleterre et Pays-Bas)

Le réseau CRUE a été mis en place pour renforcer les différents programmes de recherche européens sur les inondations, promouvoir les meilleures pratiques et identifier les lacunes et points positifs dans la gestion du risque inondation. Ses 16 partenaires, dont le Ministère de l'Ecologie et du Développement Durable, viennent des pays européens qui ont été particulièrement touchés par le risque inondation.

Le projet est piloté par le laboratoire HR Wallingford (Angleterre et Pays de Galles), en partenariat avec Deltares (Pays-Bas), le laboratoire Gester (Gestion des Sociétés, des Territoires et des Risques) de Université de Montpellier III (France) et le Laboratoire Central des Ponts et Chaussées (France).

Objectifs de la recherche:

- Les objectifs du projet sont:

1. Evaluer l'efficience et la robustesse des plans de gestion du risque inondation actuels en Angleterre, aux Pays-Bas et en France, et évaluer les méthodes qui pourraient permettre d'améliorer ces plans.
2. Evaluer les outils actuels utilisés en matière de planification de la gestion de crise inondation et la capacité de ces outils à perfectionner la gestion des futures crises liées aux inondations.
3. Etablir comment les outils actuels disponibles peuvent être utilisés pour améliorer les plans de gestion de crise «inondations» et identifier les éventuels manques au niveau de ces outils.
4. Fournir un cadre d'étude pour l'amélioration de la gestion de crise inondation à travers des études de cas en France, au Pays-Bas et en Angleterre.

- Les principaux objectifs du questionnaire sont:

1. Comprendre quelles sont les informations qui peuvent aider les gestionnaires de crise lors de l'établissement de «plans de gestion de crise inondations».
2. Connaitre les outils (méthodes, guide méthodologique, directive, logiciels d'aide à la décision etc) qui pourraient être développés afin d'aider à l'élaboration et à l'amélioration des « plans de gestion de crise inondations ».

Il est très important pour nous de connaitre vos opinions.

Votre participation à cette étude est libre. Vous pouvez vous retirer de l'enquête à n'importe quel moment. Vos réponses au questionnaire seront strictement confidentielles et seuls les résultats généraux figureront dans le rapport. Les informations seront codées et resteront confidentielles. Si vous aviez des questions concernant le questionnaire ou la procédure, veuillez contacter Freddy Vinet par e-mail à freddy.vinet@univ-montp3.fr.

La réponse au questionnaire ne devrait pas prendre plus de dix minutes.

Nous vous remercions pour l'intérêt et le temps que vous consacrez à cette étude. Merci de commencer le questionnaire en cliquant sur le bouton suivant «continue».

Continue

LCPC Laboratoire Central des Ponts et Chaussées — CRUE FLOODING ERA-NET — Université Paul-Valéry Montpellier III

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16%

Q1 Etes-vous actuellement responsable ou impliqué(e) dans la préparation d'un plan de gestion de crise «inondation» ?

- ○ Non
- ○ Ne sait pas
- ○ Oui, Plan ORSEC
- ○ Oui, Ordre d'opération Inondation
- ○ Oui, autre (préciser: PPI, PCS...)

Continue


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41%
Q2 Dans quel service travaillez-vous?
Q3. Dans quel département vous situez vous (précisez le numéro)?
Q4 Veuillez indiquer quels sont les types d'inondations concernées par ces plans (vous pouvez cocher plusieurs réponses).
Inondations de plaine
Inondations par crues torrentielles
Inondations par submersion marine
Inondations par ruissellement urbain
Inondations par rupture de barrage
Inondations par remontée de nappe phréatique
Autres - veuillez préciser
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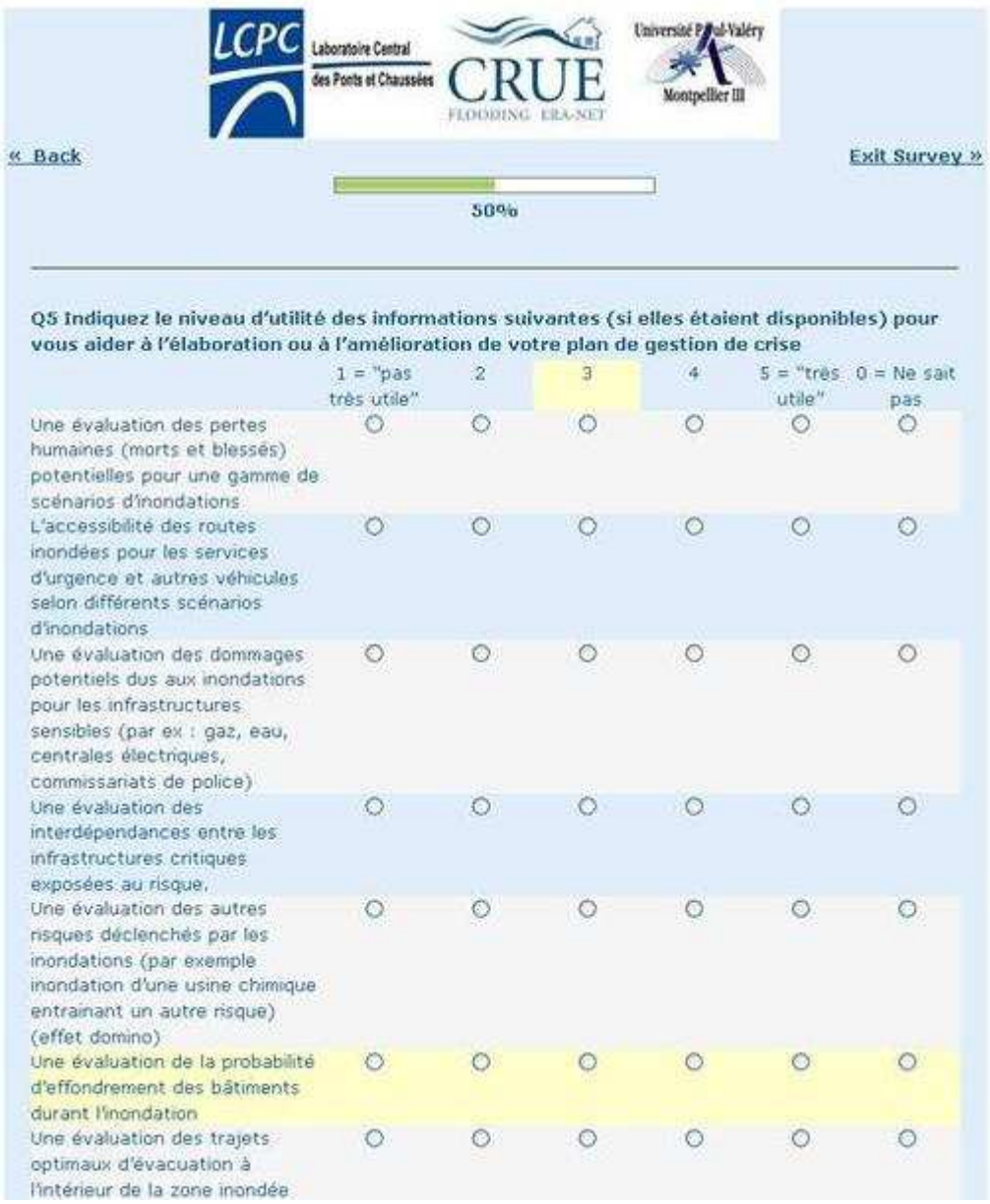

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Q5 Indiquez le niveau d'utilité des informations suivantes (si elles étaient disponibles) pour vous aider à l'élaboration ou à l'amélioration de votre plan de gestion de crise

	1 = "pas très utile"	2	3	4	5 = "très utile"	0 = Ne sait pas
Une évaluation des pertes humaines (morts et blessés) potentielles pour une gamme de scénarios d'inondations	○	○	○	○	○	○
L'accessibilité des routes inondées pour les services d'urgence et autres véhicules selon différents scénarios d'inondations	○	○	○	○	○	○
Une évaluation des dommages potentiels dus aux inondations pour les infrastructures sensibles (par ex : gaz, eau, centrales électriques, commissariats de police)	○	○	○	○	○	○
Une évaluation des interdépendances entre les infrastructures critiques exposées au risque.	○	○	○	○	○	○
Une évaluation des autres risques déclenchés par les inondations (par exemple inondation d'une usine chimique entrainant un autre risque) (effet domino)	○	○	○	○	○	○
Une évaluation de la probabilité d'effondrement des bâtiments durant l'inondation	○	○	○	○	○	○
Une évaluation des trajets optimaux d'évacuation à l'intérieur de la zone inondée	○	○	○	○	○	○

humaines (morts et blessés) potentielles pour une gamme de scénarios d'inondations						
L'accessibilité des routes inondées pour les services d'urgence et autres véhicules selon différents scénarios d'inondations	○	○	○	○	○	○
Une évaluation des dommages potentiels dus aux inondations pour les infrastructures sensibles (par ex : gaz, eau, centrales électriques, commissariats de police)	○	○	○	○	○	○
Une évaluation des interdépendances entre les infrastructures critiques exposées au risque.	○	○	○	○	○	○
Une évaluation des autres risques déclenchés par les inondations (par exemple inondation d'une usine chimique entrainant un autre risque) (effet domino)	○	○	○	○	○	○
Une évaluation de la probabilité d'effondrement des bâtiments durant l'inondation	○	○	○	○	○	○
Une évaluation des trajets optimaux d'évacuation à l'intérieur de la zone inondée	○	○	○	○	○	○
Une évaluation du temps mis pour évacuer les personnes dans les zones exposées à l'inondation.	○	○	○	○	○	○
Une évaluation de la réduction de la vulnérabilité des personnes associée à une amélioration de la diffusion des alertes	○	○	○	○	○	○
Une évaluation de la localisation optimale des abris et des zones d'hébergement	○	○	○	○	○	○

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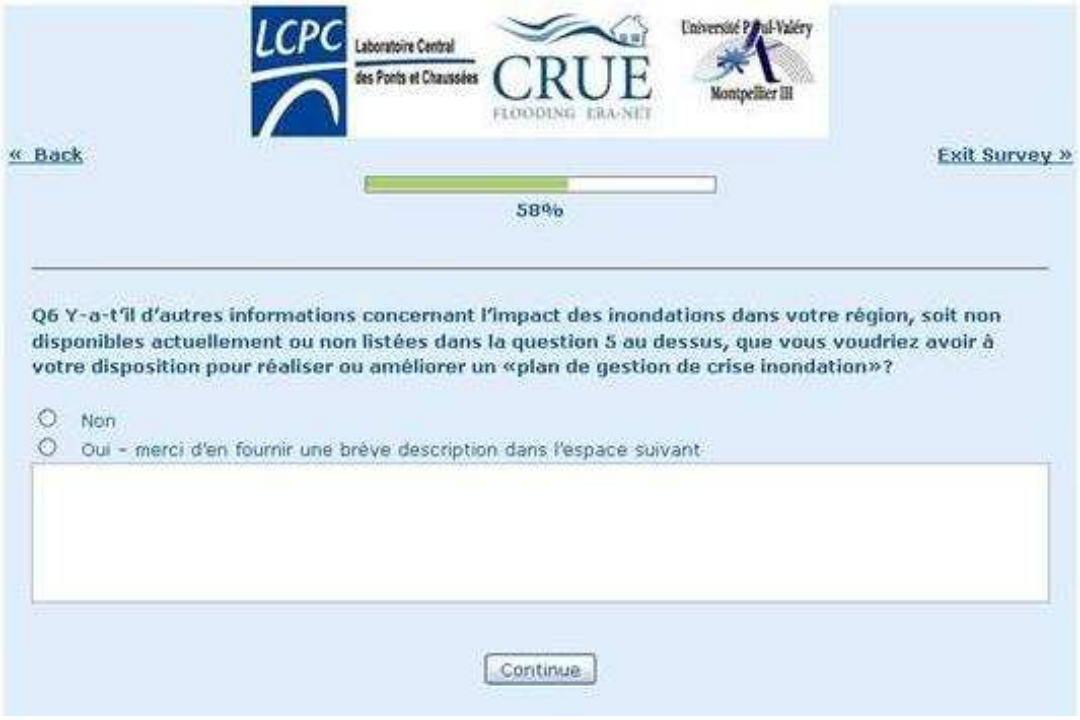
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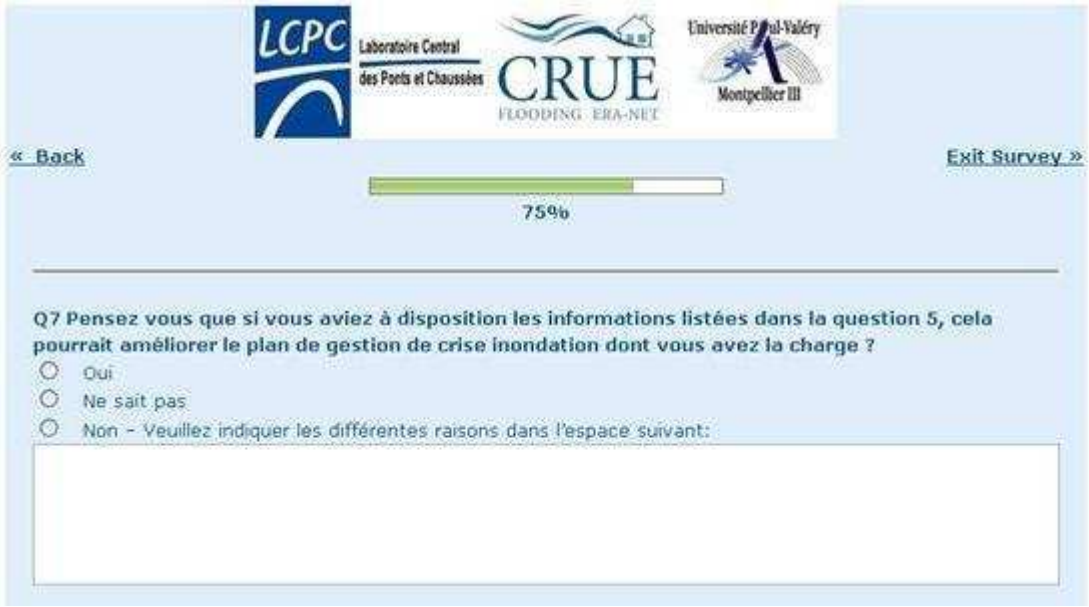
58%
Q6 Y-a-t'il d'autres informations concernant l'impact des inondations dans votre région, soit non disponibles actuellement ou non listées dans la question 5 au dessus, que vous voudriez avoir à votre disposition pour réaliser ou améliorer un «plan de gestion de crise inondation»?
Non
Oui - merci d'en fournir une brève description dans l'espace suivant
Continue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75%
Q7 Pensez vous que si vous aviez à disposition les informations listées dans la question 5, cela pourrait améliorer le plan de gestion de crise inondation dont vous avez la charge ?
Oui
Ne sait pas
Non - Veuillez indiquer les différentes raisons dans l'espace suivant:

Q8 Parmi les informations et données suivantes, veuillez indiquer quel est selon vous le niveau de détail à faire figurer dans les plans pour permettre une bonne gestion de crise inondation?

	1 = Pas utile	2 = Peu détaillé	3 = Moyennement détaillé	4 = Assez détaillé	5 = Très détaillé	0 = Ne sait pas
Délai d'anticipation de l'alerte aux inondations	○	○	○	○	○	○
Cartographie montrant l'extension de l'inondation	○	○	○	○	○	○
Cartographie des hauteurs d'eau, des vitesses et des zones d'écoulement majeurs	○	○	○	○	○	○
Vulnérabilité des personnes en termes de blessures et décès potentiels	○	○	○	○	○	○
Vulnérabilité des bâtiments	○	○	○	○	○	○
Impact des inondations sur les infrastructures sensibles	○	○	○	○	○	○
Temps et trajets d'évacuation	○	○	○	○	○	○
Potentialité qu'un autre risque se produise suite à une inondation	○	○	○	○	○	○
Abris, zones de repos et refuges sécurisés	○	○	○	○	○	○
Efficacité de la mise en place de mesures de sauvegarde temporaires (sacs de sables, défenses temporaires)	○	○	○	○	○	○
Ressources appropriées mobilisables (matérielles et humaines)	○	○	○	○	○	○

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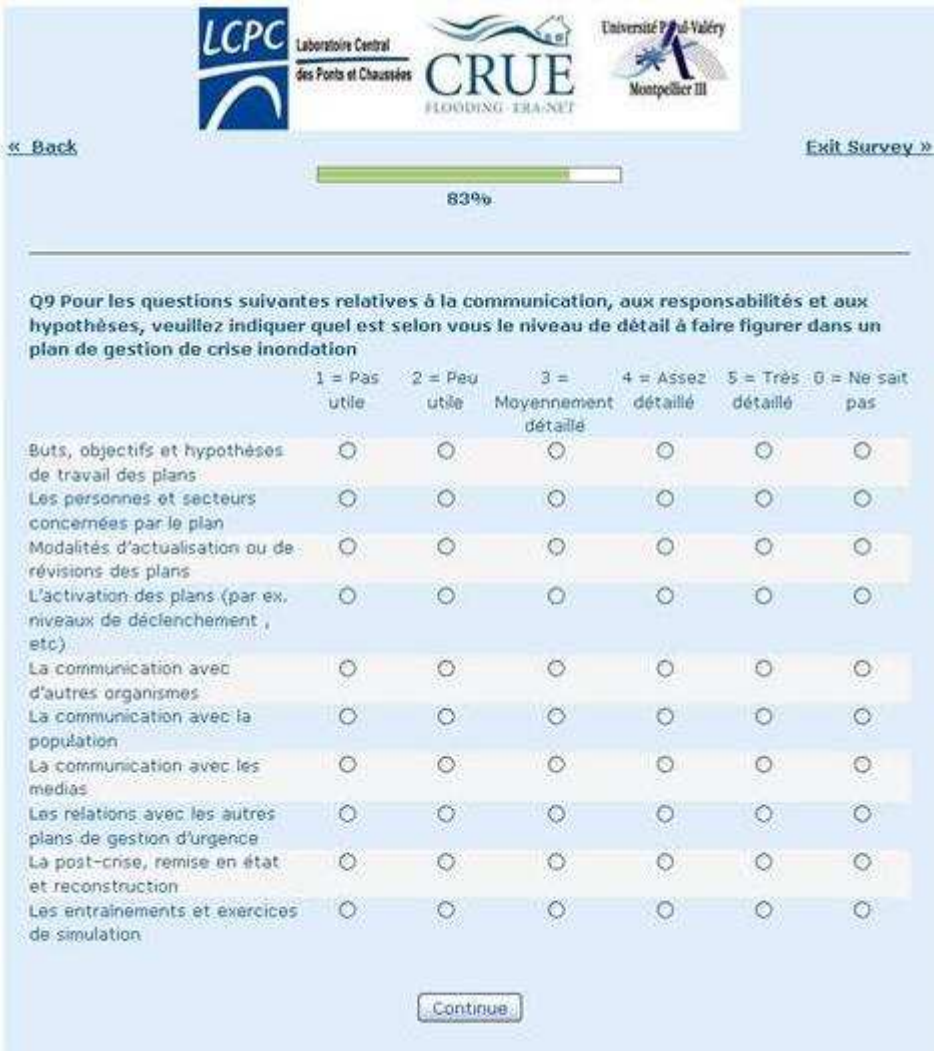

« Back Exit Survey »

83%

Q9 Pour les questions suivantes relatives à la communication, aux responsabilités et aux hypothèses, veuillez indiquer quel est selon vous le niveau de détail à faire figurer dans un plan de gestion de crise inondation

	1 = Pas utile	2 = Peu utile	3 = Moyennement détaillé	4 = Assez détaillé	5 = Très détaillé	0 = Ne sait pas
Buts, objectifs et hypothèses de travail des plans	○	○	○	○	○	○
Les personnes et secteurs concernées par le plan	○	○	○	○	○	○
Modalités d'actualisation ou de révisions des plans	○	○	○	○	○	○
L'activation des plans (par ex. niveaux de déclenchement , etc)	○	○	○	○	○	○
La communication avec d'autres organismes	○	○	○	○	○	○
La communication avec la population	○	○	○	○	○	○
La communication avec les medias	○	○	○	○	○	○
Les relations avec les autres plans de gestion d'urgence	○	○	○	○	○	○
La post-crise, remise en état et reconstruction	○	○	○	○	○	○
Les entrainements et exercices de simulation	○	○	○	○	○	○

Continue

Merci pour le temps que vous avez accordé à cette enquête. Le rapport final du projet sera disponible sur le site web du projet www.fimframe.net en 2011. Cependant, des résultats intermédiaires au niveau du questionnaire devraient être disponibles au téléchargement sur le site web FIM FRAME en mai 2010. Pour de plus amples informations ou si vous souhaiter faire d'autres suggestions (votre avis détaillé nous intéresse), vous pouvez contacter Freddy Vinet par e-mail à l'adresse suivante : freddy.vinet@univ-montp3.fr ou Olivier Payrastre par e-mail à l'adresse suivante : olivier.payrastre@lcpc.fr.

Thank you for completing this survey

Appendix G Online survey carried out in the Netherlands

Exit Survey »

7%

Geachte mevrouw, mijnheer,

Deze korte enquête (minder dan 10 minuten) vindt plaats in het kader van het Europese onderzoeksproject Flood Incident Management a FRAMEwork for improvement (FIM Frame, www.fimframe.net).
- Het FIM Frame project is onderdeel van het Europese onderzoeksprogramma ERA-NET CRUE (www.crue-eranet.net).
- Doel van het CRUE programma is het versterken van bestaande Europese onderzoeken m.b.t. overstromingsrisico, het promoten van 'best practices' en het identificeren van behoeftes en kansen voor toekomstige samenwerking tussen Europese landen.
- Het FIM Frame project wordt geleid door het Engelse onderzoeksinstituut HR Wallingford. Verder werken aan het project mee: Deltares (Nederland), Universiteit van Montpellier (Frankrijk) en Laboratoire Central des Ponts et Chausées (Frankrijk).

De doelen van het FIM Frame project zijn:
- Het evalueren van de effectiviteit en robuustheid van huidige rampenplannen voor overstromingen in Groot-Brittannië, Nederland en Frankrijk en het evalueren van methoden waarmee de plannen verbeterd kunnen worden.
- Het verkrijgen van overzicht van (potentiële) instrumenten (methoden, richtlijnen, handleidingen, software etc) die gebruikt worden bij het maken van rampenplannen en inzicht in en de meerwaarde van deze instrumenten bij het opstellen van de rampenplannen.
- Het bepalen hoe de beschikbare instrumenten gebruikt kunnen worden om rampenplannen te verbeteren en het identificeren van lacunes m.b.t. instrumenten.
- Het ontwikkelen van een kader (framework) te gebruiken om rampenplannen te verbeteren.
Het kader zal getoetst worden binnen verschillende pilot gebieden in Nederland, Groot-Brittannië en Frankrijk.

Deze enquête wordt gehouden in het kader van het eerste en tweede projectdoel en moet inzicht geven in de informatie en instrumenten die kunnen bijdragen bij het opzetten van rampenplannen.

Wij waarderen het zeer indien u bereid bent deel te nemen aan deze enquête omdat uw inbreng erg waardevol voor ons zal zijn. Uw deelname aan deze enquête is geheel vrijwillig.

Uw antwoorden op de enquête vragen zijn anoniem. In aanvulling worden de resultaten gecodeerd. Met uw reacties zal vertrouwelijk worden omgegaan en resultaten van de enquête worden alleen gebruikt voor het FIM Frame project en door het FIM Frame projectteam. Indien u vragen hebt over de enquête of de procedure, dan kunt u contact opnemen met Karin Stone (karin.stone@deltares.nl) of Darren Lumbroso (d.lumbroso@hrwallingford.co.uk.).

Het invullen van deze enquête kost niet meer dan 10 minuten. Namens het projectteam dank ik u voor uw tijd. U kunt de enquête opstarten door op de 'Continue' knop te klikken.

Continue

« Back Exit Survey »

15%

In de enquête wordt de term 'rampenplan' gebruikt. Onder rampenplan wordt rampen- of crisisplannen en de onderliggende rampen- of crisisbestrijdingsplannen verstaan.

Q1. Bent u momenteel betrokken en/of verantwoordelijk voor het opstellen van rampenplannen?

- ○ Ja
- ○ Nee
- ○ Onduidelijk

Continue


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Exit Survey »
30%
Q2 Bij het opstellen van welk rampenplan bent u betrokken.
-- Select --
Q3 Kunt u aangeven met welke type overstroming u in uw gebied te maken heeft? (meerdere antwoorden mogelijk).
Overstroming vanuit de grote rivieren
Overstroming vanuit zee
Overstroming vanuit regionale wateren (boezemwateren, beken etc.)
Continue

Q4 Kunt u voor de hieronder genoemde informatie aangeven of deze (potentieel) van nut is bij het opstellen van rampenplannen en indien ja, welk detailniveau gewenst is om effectief te zijn.

	"Niet nuttig"	1 = "Laag detailniveau"	2	3	4	5 = "Hoog detail niveau"	"Geen mening"
Voorspellingstijden	○	○	○	○	○	○	○
Omvang overstromingsgebied	○	○	○	○	○	○	○
Waterdiepte, stroomsnelheden en verloop overstroming	○	○	○	○	○	○	○
Slachtoffer risicokaarten	○	○	○	○	○	○	○
Potentiele Schadekaarten	○	○	○	○	○	○	○
Kwetsbaarheid en/of Risicokaarten	○	○	○	○	○	○	○
Impact op kritieke infrastructuur	○	○	○	○	○	○	○
Optimale evacuatie routes	○	○	○	○	○	○	○
Benodigde tijd om te evacueren	○	○	○	○	○	○	○
Keteneffecten (bv. een chemische ramp a.g.v. een overstroming)	○	○	○	○	○	○	○
Optimale shelters en opvang locaties	○	○	○	○	○	○	○
Effect van toepassen van maatregelen (bv. zandzakken, tijdelijke keringen)	○	○	○	○	○	○	○
Beschikbaarheid resources	○	○	○	○	○	○	○
De toegankelijkheid van geinundeerde wegen voor hulpdiensten en andere voertuigen	○	○	○	○	○	○	○
Kans op instortingsgevaar van gebouwen	○	○	○	○	○	○	○
Het effect van risicocommunicatie en waarschuwing	○	○	○	○	○	○	○

Continue

« Back

Exit Survey »

46%

Q5 Van welk van onderstaande informatie bent u al op de hoogte van het bestaan of wordt nu al gebruikt bij het opstellen van de rampenplannen voor overstromingen binnen uw organisatie.

	"Op de hoogte"	"Gebruikt bij plannen"
Voorspellingstijden	○	○
Omvang overstromingsgebied	○	○
Waterdiepte, stroomsnelheden en verloop overstroming	○	○
Slachtoffer risicokaarten	○	○
Potentiële Schadekaarten	○	○
Impact op kritieke infrastructuur	○	○
Optimale evacuatie routes	○	○
Benodigde tijd om te evacueren	○	○
Keteneffecten (bv. een chemische ramp a.g.v. een overstroming)	○	○
Optimale shelters en opvang locaties	○	○
Effect van implementatie van maatregelen (bv. zandzakken, tijdelijke keringen)	○	○
Beschikbaarheid resources	○	○
De toegankelijkheid van geïnundeerde wegen voor hulpdiensten en andere voertuigen	○	○
Kans op instortingsgevaar van gebouwen	○	○
Het effect van risicocommunicatie en waarschuwing	○	○


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« Back
Exit Survey »
53%
Q6 Is er nog andere informatie die binnen uw gebied wordt gebruikt of waar u behoefte aan heeft welke niet in deze lijst is genoemd?
Nee
Ja - Kunt u in de onderstaande box een korte beschrijving van deze informatie geven.
Continue


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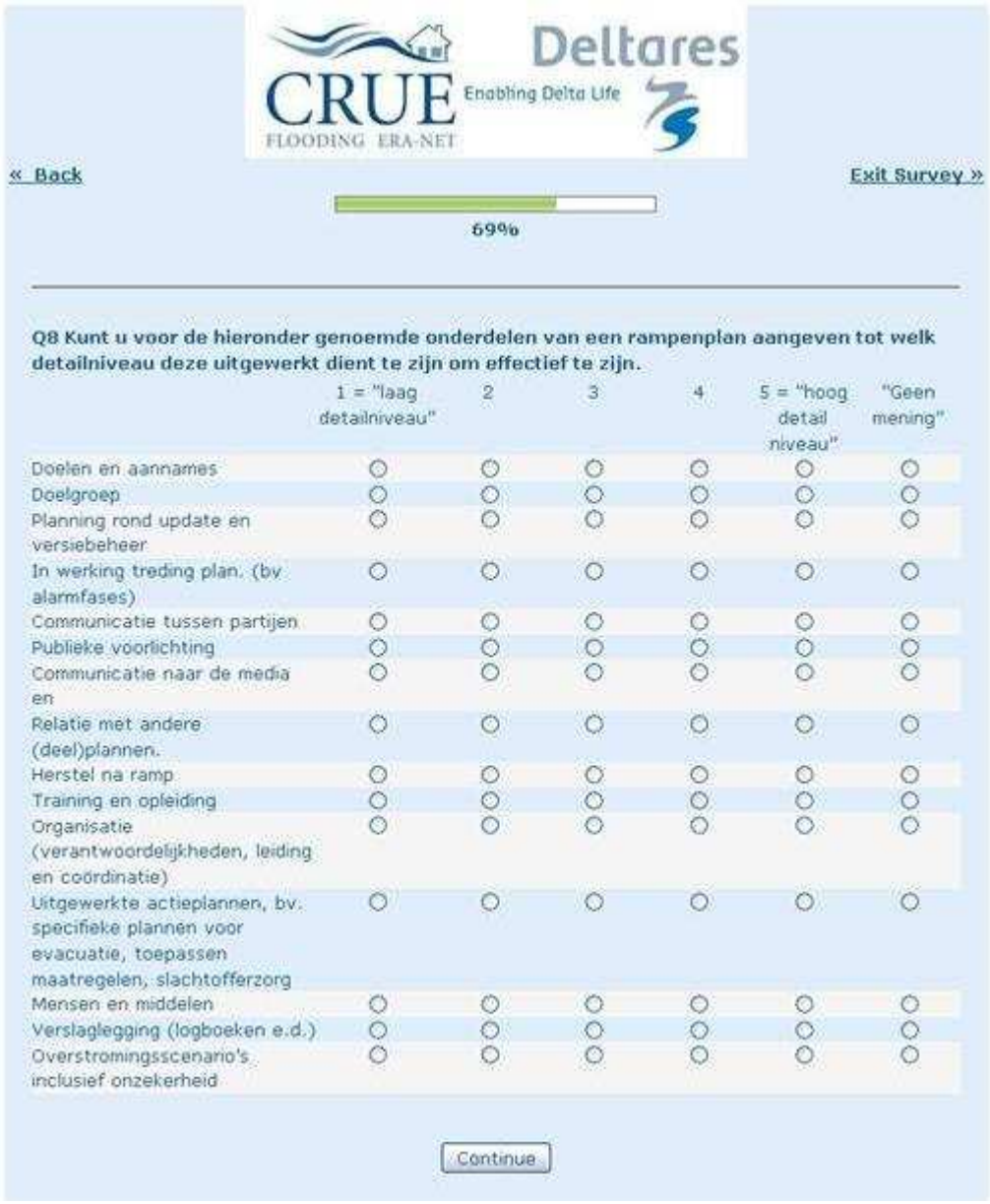
Exit Survey »
61%
Q7 Indien u de beschikking heeft over de door u als nuttig aangemerkte informatie in vraag 4, 5 en 6, zou dit bijdragen aan een verbetering van het rampenplan.
Ja
Ik weet het niet
Nee - Kunt u dit alstublieft motiveren in onderstaande box.
Continue



« Back

Exit Survey »

69%

Q8 Kunt u voor de hieronder genoemde onderdelen van een rampenplan aangeven tot welk detailniveau deze uitgewerkt dient te zijn om effectief te zijn.

	1 = "laag detailniveau"	2	3	4	5 = "hoog detail niveau"	"Geen mening"
Doelen en aannames	○	○	○	○	○	○
Doelgroep	○	○	○	○	○	○
Planning rond update en versiebeheer	○	○	○	○	○	○
In werking treding plan. (bv alarmfases)	○	○	○	○	○	○
Communicatie tussen partijen	○	○	○	○	○	○
Publieke voorlichting	○	○	○	○	○	○
Communicatie naar de media en	○	○	○	○	○	○
Relatie met andere (deel)plannen.	○	○	○	○	○	○
Herstel na ramp	○	○	○	○	○	○
Training en opleiding	○	○	○	○	○	○
Organisatie (verantwoordelijkheden, leiding en coördinatie)	○	○	○	○	○	○
Uitgewerkte actieplannen, bv. specifieke plannen voor evacuatie, toepassen maatregelen, slachtofferzorg	○	○	○	○	○	○
Mensen en middelen	○	○	○	○	○	○
Verslaglegging (logboeken e.d.)	○	○	○	○	○	○
Overstromingsscenario's inclusief onzekerheid	○	○	○	○	○	○

Continue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Exit Survey »
76%
Q9 Wat zijn volgens u de 5 belangrijkste criteria die bepalen of een rampenplan voor overstromingen effectief is?
Continue

« Back

Exit Survey »

100%

Q10 Maakt uw organisatie gebruik van instrumenten (methodes, richtlijnen, handleidingen, software etc) bij het opmaken van rampenplannen?

- Nee
- Ja, namelijk:

Q11 Heeft u aanvullende behoefte aan (al dan niet bestaande) instrumenten die kunnen bijdragen aan het verbeteren van rampenplannen voor overstromingen?

- Nee
- Ja, namelijk:

Q 12 In onderstaande box kunt u eventuele aanvullende opmerkingen of aanvullingen geven.

Hartelijk dank voor uw tijd. De definitieve project resultaten zullen in 2011 beschikbaar komen op de project website (www.fimframe.net). Resultaten van deze enquête zullen vanaf mei 2010 via de project website beschikbaar gesteld worden. Voor vragen en informatie kunt u ook contact opnemen met Karin Stone (karin.stone@deltares.nl) of de project coördinator Darren Lumbroso (d.lumbroso@hrwallingford.co.uk).

Thank you for completing this survey

Appendix H Results of English and Welsh survey

Table H1 Please indicate the level of usefulness of the following information, if it were available, in assisting you with the formulation of Local Resilience Forum Multi Agency Flood Plans?

Percentage of responders for each "level" of usefulness	Potential injuries and loss of life for a range of flood scenarios	The accessibility of inundated roads to emergency services and other vehicles for different flood scenarios	Potential damage to critical infrastructure	The inter-dependencies between at risk critical infrastructure	Other hazards triggered as the result of flooding	Probability of buildings collapsing during a flood	Optimal evacuation routes from the inundated area	The time to evacuate people from areas at risk of flooding	How improvements in the dissemination of flood warnings could reduce the risk to people
1 = Not very useful	4%	0%	1%	1%	1%	1%	0%	1%	3%
2	11%	1%	0%	1%	3%	5%	1%	5%	8%
3	23%	3%	5%	4%	11%	26%	10%	12%	14%
4	20%	23%	16%	31%	22%	**32%**	19%	16%	25%
5 = Very useful	**36%**	**70%**	**76%**	**61%**	**61%**	**32%**	**64%**	**61%**	**49%**
0 = Don't know	5%	3%	1%	1%	3%	4%	6%	4%	1%

Table H2 **Please indicate what you believe is the most appropriate level of detail for the following information and data in a Multi Agency Flood Plan?**

Percentage of responders for each "level" of detail	Flood warning lead times	Flood map showing flood extent	Flood map showing depths, velocities and flow routes	Flood risk to people in terms of potential injuries and loss of life	Flood risk to properties	Impacts of floods on critical infrastructure	Evacuation routes and times	Potential for other hazards that may occur because of flooding	Shelters, rest areas and safe havens	Implementation of measures (e.g. sand bags, temporary defences)	Availability of the appropriate resources
1 = Not detailed in the plan	1%	0%	0%	1%	1%	0%	1%	1%	0%	1%	0%
2	1%	1%	4%	9%	4%	0%	3%	4%	4%	8%	7%
3	18%	6%	18%	20%	19%	7%	17%	30%	30%	**41%**	30%
4	39%	44%	**39%**	**36%**	**44%**	37%	**39%**	**43%**	**37%**	28%	**38%**
5 = Very detailed	**40%**	**49%**	38%	33%	31%	**56%**	38%	20%	30%	21%	25%
0 = Don't know	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%

Table H3 **Please indicate what you believe is the most appropriate level of detail for the following issues related to communication, responsibilities and assumptions in a Multi Agency Flood Plan?**

Percentage of responders for each "level" of detail	Aims, objectives and assumptions of plan	Target audience of plan	Details of modifications to and updating of the plan	Plan activation (e.g. trigger levels etc)	Communication with other agencies	Communication with the public	Communication with the media	Relationship with complementary emergency management plans	Details of recovery	Training and exercises
1 = Not detailed in the plan	0%	0%	0%	0%	0%	0%	0%	0%	1%	4%
2	9%	13%	14%	0%	0%	0%	0%	4%	6%	13%
3	31%	34%	33%	6%	9%	10%	16%	20%	20%	19%
4	**39%**	**40%**	**43%**	36%	39%	41%	40%	**43%**	**53%**	**51%**
5 = Very detailed	21%	13%	9%	**58%**	**53%**	**49%**	**44%**	33%	20%	13%
0 = Don't know	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Q6 Is any other information related to the impacts of flooding in your area, either not currently available or listed in Question 5 above, that you would like to have available to assist you in formulating Multi Agency Flood Plans?

All the comments relating to this question have been grouped into the headings below.

Flood hazard maps

- Extent and depth of flood water for a variety of scenarios
- Water depth/velocity/hazard mapping, but currently understand that this will be available from the Environment Agency (EA), as will impact of blockage scenarios.
- Depth of flood water for a range of scenarios (e.g. for a one in 5 year event, 1 in 10 year event etc). At the present time we have a line on a map one side is flooded the other isn't... but no indication of depth, this makes writing credible plans extremely difficult.
- Availability of flood modelling maps
- Improved mapping
- The current flood maps (i.e. 1 in 100 years) are useful for deciding if you live in a potentially vulnerable area but don't really help the response - e.g. knowing which areas are going to be affected first, prioritising evacuation etc.

Critical infrastructure

- The levels that impinge upon water treatment works
- Levels where structural stability of bridges would be questioned.
- Potential impacts on critical communications suppliers
- Location of critical national Infrastructure, but there are obvious problems with that.
- Where critical infrastructure identified within a flood footprint, the estimated footprint of area affected by the loss of that infrastructure
- Difficulties are being experienced in obtaining some information regarding the critical infrastructure surrounding the utilities, they say in respect of security
- Flood equipment and location availability

Evacuation and transport

- Factoring in the vulnerable nature of the evacuees and the impact on the time to evacuate.
- Scenarios with linked impacts and information on best evacuation routes etc - but those which can be prepared beforehand are unlikely to match the real event
- Pre planned transport diversion routes
- History of road surface water flooding may be useful
- Impacts on main railways as well as roads
- Evacuation time and routes in case of reservoir inundation

Trigger and forecast levels

- Trigger levels for flooding of areas other than standard gauge points
- Formal identification of individual agencies ""trigger"" points.
- It would be very useful to have access to maps which show the extent of flooding at different gauge levels: i.e. at 3.6 metres, this area will be flooded. At 3.8 metres, this area will be flooded. At 4.2 metres, this area will be flooded.
- Web availability of river levels and forecast levels
- Information on lead times, peaks etc during a flood event

Flood Warnings

- The current Flood Warning fax system is being reviewed. Police respond to actual incidents happening so any warning must indicate that response is required. Too many false alarms or 'standby' warnings at too low a threshold are of no value, and actually devalue the impact of a required response. The warning must be clear and effective and as accurate as possible.

- We have reservations about the need to change Flood Warnings - they are meaningful and have proven to work well; the public are used to them and take action.
- Flood Warnings must remain meaningful and workable as they are at present.
- It is difficult to see how the proposed changes and the levels at which Flood Warnings will be issued will be effective on the ground. Communities at greatest risk are already well prepared and cope with regular flooding. Communities at risk when Severe Warnings are currently issued may be disenfranchised as there will not be any Severe Warnings.

Other comments

- Identified areas to pump water to in the event of flooding, this would eliminate the second guess.
- Recovery - likely times frames for repairing damaged property.
- Length of time for standing flood water to drain away.
- Critically, historical rainfall from the Met Office and where it has led to surface water problems. This then becomes a potential trigger for future events. currently this information costs from the Met Office and is therefore unavailable.
- The major of the information in Question 5 I don't currently have.

Q10 Please briefly list up to five criteria that that you believe makes a Multi Agency Flood Plan effective?

1. Generic Response required by different types of flooding
2. Specific location differences and considerations
3. Maps showing the extent and assets within the specific locations
4. Community Impact Assessments (CIA)
5. Prioritised approach and risk assessment process that identifies the specific locations requiring CIAs

1. Clear and simple to use
2. Availability of data

1. Effective partnership working to develop the plan
2. The correct level of detail dependent on the status of the plan i.e. strategic, tactical or operational
3. Training and exercising
4. Incorporating lessons learned following training, exercising or a real incident
5. Communication

1. Clear and unambiguous information
2. Testing and exercising the plan
3. Good quality up to date flood maps
4. Quality annexes with geo-codes for site specific information
5. Document not too weighty

1. Asset Database for all culverts rivers etc
2. Locations of flooding area including UU provided on a data base
3. use of experienced of local Highways staff in providing data for plan
4. list of proposed developments/civil works affecting drainage new housing developments
5. working together with other agencies

1. Consultation
2. Clarity
3. Do not duplicate information found in other Plans
4. Good lead time
5. Detail of flood extent including depths and velocities
6. Evacuation routes and times
7. Compromised and available protection measures for critical infrastructure

1. Not duplicate contents of other plans but provide a quick route to the information needed.
2. Simple language, easy to reference and use with maximum use of maps, tables, diagrams, charts and minimum use of paragraphs of text.
3. Be available in electronic and paper format, interactive GIS and real time/forecast animations of flooding area and consequences etc. incl. automated outputs.
4. Be proportionate in the amount of detail contained reflecting the degree of risk to life, not too prescriptive and be flexible and able to take account of real time strategic and tactical considerations and decision making (not a tick box approach!)
5. Involve/consult users in its development and delivery, regular training, testing and updating and be adopted/integrated as an essential tool in the emergency planning and response kit bag as opposed to a 'bolt on'

1. Maps of areas that would be affected
2. Details of critical Infrastructure that would be affected
3. Details of population that would be affected i.e. numbers and any hospitals or disabled people
4. Evacuation plans
5. Details of rest centres

1. Clear Activation Procedures.
2. Highlighting critical infrastructure and how it is impacted.
3. Highlighting vulnerable people and areas
4. Clear inter-organisational communication structures

1. Accurate roles & responsibilities
2. Detailed information on lead times for flooding
3. Detailed information on flood risk areas
4. Accurate contact details & resource information
5. Methods of public warning & informing available

1. Multi-agency input in the development of the plan.
2. Multi-agency involvement in the testing and exercising of the plan.
3. Very clear communication links between agencies.
4. Explicit trigger/activation points (or as best as possible).
5. Understanding of the impact of flooding in neighbouring areas and their local flood plans

1. Activation & trigger Levels
2. Scope
3. Communication between parties & defined communication lines
4. Risk impact
5. Maps and visualisation tools

1. Roles and responsibilities of agencies related to flood incident response
2. Detailed maps as per previous
3. C(N)I considerations

1. Clear trigger points
2. Clear contact databases
3. Clear Roles and responsibilities of partner organisations
4. Clear media strategy
5. Clear response and recovery strategy and handover points

1. Audience
2. Trigger levels
3. Roles of each agency

4. Contact details for each agency
5. Risk levels in county

1. Ease of use
2. If electronic hyperlinks are useful
3. Information to the point - actions
4. No background detail
5. Regular review and update

1. Simplicity with regard to usage.
2. Clearly defined actions required at defined locations and timescales.
3. Clear understanding of what actions agencies are able/willing to undertake.
4. Reviews and amendments that are relative.

1. Usefulness of the plan (i.e. user friendly with the right information).
2. Sign post to other relevant plans.
3. Consistency of Information (in particularly with other plans).
4. Actions chart in the early stages of the plan (with sign posts to relevant sections of the plan should further details be required to assist decision making)."
5. Maximum lead in time, good understanding of flooding extent and optimum use of available resources.

1. Aim
2. Scope
3. Objectives
4. Roles and responsibilities
5. Contact details

1. All agencies contribute fully
2. Clarity about who does what when
3. Reliable and fully shareable data, preferably live

1. Awareness and availability of plan to relevant responders
2. Detail of extent of flooding
3. Detail of critical facilities
4. Detail of mitigation resources
5. Contact information for other responders

1. Aim
2. Triggers
3. Roles and responsibilities
4. contact lists
5. Voluntary sector assistance

1. Effective communication
2. Comprehensive planning
3. Exercises
4. Multidisciplinary working relationships
5. Debrief

1. Quick and easy to interpret and draw immediate conclusions from, even from people not expert in the data behind it
2. Enough detail to enable effective response, but not so much as to imply false accuracy in predicting a scenario, or to impede quick response

3. All decisions and provisions that can be made before hand; have been - e.g. rest centres established and full details given
4. Does not contain detail that is likely to become out of date quickly (such as contact numbers) - rather a link to where the up to date information can be found

1. A clear trigger
2. Accuracy
3. Ease of access to plan
4. Comprehensiveness
5. Multi agency contribution
6. Prior training and exercising to generate familiarity with plan

1. Clearly identified areas at risk
2. Clear and detailed trigger points
3. Detailed roles and responsibilities of responding agencies
4. Safe pre-designated evacuation routes to pre-identified Welfare/Rest Centres
5. Interdependencies with other response plans/arrangements

1. Easy to use
2. Clear, concise actions
3. Short
4. Plenty of maps
5. Clear communication strategy

1. Contains accurate and reliable information on which areas will flood and when
2. Effective communication between organisations, the public and the media
3. A clear structure for how the response will be co-ordinated between organisations and at the strategic, tactical and operational level
4. Operational procedures (e.g. delivery and prioritisation of sandbags, collating information on road closures)

1. Details on population to be affected
2. Actions plans for those required to respond
3. Prepared public info
4. risk assessment of flood warnings
5. training and awareness

1. Who responds
2. What each responder has responsibility for
3. Where the target area(s) is for responders and where they liaise
4. When they respond (trigger levels)
5. Why (circumstances /sitrep)

1. Differentiate between a flood plan and flood guidance. (A flood plan should be to activate and set structure in place. Guidance provides greater info) Mixing the two makes a plan unusable in crisis.
2. Clear Activation processes
3. Remove any vague words - should, may, might,. replace with commands - -will, must etc
4. Plan needs to be short and to the point
5. Clear mapping"

1. Who is going to use it?
2. How it is triggered and by whom?
3. Up-to-date contacts and arrangements
4. Who does what, when and how?
5. Mutual Aid arrangements

1. Clear Roles and Responsibilities
2. Clear focus, scope and objectives
3. Clear communication routes
4. Document is clear on the level of response i.e. the plan is strategic, tactical or operational – not a mixture.
5. Concisely written

1. Clarity of Roles & Responsibilities of responding agencies
2. Regular Consultation between emergency responders on Plan Content (effective LRF involvement)
3. Local information (e.g. based on District Council Area) for local operational staff
4. Operational Response meetings annually
5. Good cross-referencing to other supporting emergency arrangements - eg rest centres / recovery plans

1. Details of areas at risk of flooding
2. Impact of flooding on critical infrastructure
3. Activation triggers of plan
4. Activating command and control structures
5. Evacuation and shelter information

1. Clear definition of agency roles and responsibilities and links to related plans.
2. Detailed mapping of potential flooding scenarios.
3. An indication of threats to CNI (although protective marking may reduce usefulness) or other critical infrastructure.
4. Appendices for each agency to outline threats to their own individual Business Continuity from flooding scenarios of different magnitudes.
5. Outline of potential recovery strategies which may be assisted by early decisions in the response phase.

1. Useable- i.e. not overly long
2. Clear audience- i.e. who is it designed to be used by
3. Clear activation, trigger and actions taken by who at each stage
4. Not duplicating information in other plans - this seemed to be the case in the last checklist. as long 5 as info can be sourced from another plan or signposted to another system (i.e. vulnerable people)

1. Clear Triggers
2. Roles and Responsibilities
3. Actions per agency
4. Communication
5. Recovery

1. Clearly identifying the area potentially affected and the impact of the flooding
2. Highlight to the silver commander what he needs to consider; local of key locations to evacuate and key infrastructure to protect
3. Clearly identified triggers with lead-in times, including reference to past rainfall and consequences
4. An 'owner' - who is monitoring weather conditions and starts the activation process
5. It must be practical for a gold/silver commander. if they need to wade through many different templates to get a picture of all the places that flood and the consequences, it will be hard to formulate a co-ordinated and prioritised response. Perhaps an IT alternative supports the plan, making the decision-making easier in practise. "

1. Activation triggers
2. Related Plans
3. What responders are doing and when

4. Risks for specific areas
5. Recovery planning

1. Clear Roles and Responsibilities,
2. Identification of critical infrastructure;
3. Clear triggers to actions, responses, command and control, evacuation;
4. Good mapping availability to support all agencies;
5. Good continuity and recovery plans"

1. Clear definition and guidance on how the plan is activated.
2. Multi-agency cohesion detailed in the plan
3. Maps and visual aids for assistance in effective decision making
4. Distinctive links between the various levels of warning and what resources each one triggers
5. Infrastructure information"

1. Partner involvement
2. Awareness across the EP world
3. Clear lines of communication
4. Roles & responsibilities"

1. Clear info on likely areas/footprints and what is within the area(s)
2. Activation procedures
3. Communication links
4. Identifying critical infrastructure within flooded area and an understanding of the effect of losing any of that infrastructure
5. Clear understanding of each agencies response capabilities

1. Information flow
2. Warning the public
3. Trigger levels

1. Includes CNI
2. Sets out triggers
3. Sets out roles and responsibilities
4. Sets out flood extent and impacts

1. Communication
2. Planning
3. Historical data
4. Risk assessments

1. Roles and Responsibilities of organisations
2. Detailed flood maps
3. Flow charts
4. Action cards for various flood warnings
5. Related plans

1. Better awareness of partner agencies capabilities
2. Better awareness of equipment/manpower availability
3. Agreed trigger levels to stop agencies working in isolation
4. More coordinated response for dealing with the public and media
5. Ensures partner agencies retain flooding on their agenda

1. Activation
2. Triggers

3. Mapping
4. Actual roles and responsibilities
5. Definition of evacuation vs rescue

1. Produced locally
2. Arrangements flexible enough to adapt to individual circumstances
3. Usability
4. Identifies key priorities for consideration by Gold command

1. Content actively reviewed by all key responding agencies and responsibilities agreed
2. Content gives sufficient details to enable responders to understand the topography and specific characteristics of the flood risk in the area covered.(NB chief officers in some organisations may never have been involved in a flooding incident)
3. Content provides clear steps and data for consideration of responses to the early stages of a flooding incident (for e.g. how to use the Environment Agency warnings, contact details of Environment Agency Flooding Incident officers etc)
4. Content provides clear view of roles of key agencies.
5. MAFP exercised and actively debriefed

1. Details of where it will flood
2. Numbers affected by potential flooding
3. Roles and Responsibilities clearly spelt out and agreed (no assumptions made by any organisation)
4. Clear and concise communication methods and information sharing
5. Details of all critical infrastructure and potential impacts if these are affected or impacted on by flooding

1. Training
2. Exercising
3. Information Sharing

1. The format should reflect the style of other local plans making it easier to use.
2. The plan should say if it is strategic or tactical and the content reflects the intended audience.
3. The plan should link with other plans that may be activated at the same time and the plans QA to ensure they do not clash.
4. Special consideration for vulnerable people should be included in tactical plans.

1. Relevant
2. Realistic
3. Comprehensible
4. Consistent
5. Up to date
1. Use of Pitt review recommendations
2. Multi Agency collaboration
3. Identification of key risks within the Geographical area
4. Effective action cards"

1. Brevity: Even if it means leaving information out, short plans are better because people might actually pick them up and read them. Nobody has time to read war and peace in an emergency.
2. Inclusivity: There are organisations who can provide valuable input and assistance who are not currently included in plans.
3. Simplicity: Don’t over complicate by trying to include everything. Critical infrastructure is the same or similar in any type of emergency, so have a separate critical infrastructure plan rather than making the flood plan bigger.

1. Outline of the flood risk areas

2. Specific responsibilities for response agencies
3. Command and Control arrangements
4. Arrangements for warning and informing the public
5. Trigger points and actions

1. Proper 'joined up' approach and formation of the plan.
2. Contribution by individual agency's reflecting what can be delivered.
3. A simple plan without great detail - signposting where further information is rather than including in the plan to make it a bulky, dust gathering, document.
4. Engagement through LRF to truly reflect and seek engagement from all stakeholders.

1. Keep the plan as brief / user friendly as possible
2. Signpost to specific plans held by individual organisations
3. Realistic
4. Clear roles and responsibilities

1. Sharing information and skills (e.g. certain agencies are better placed to access national databases, knowledge of flooding, map production etc than others)
2. User friendly terminology and structure - anyone from any agency should be able to pick up the plan and use it with no prior knowledge.
3. Structured e.g. from general principles applicable across an LRF area to specific locations and information.
4. National support to provide economies of scale - for example why does every LRF have to identify responsibility for disposal of carcasses? surely this could be addressed and issued in the guidance?
5. Standardisation between LRF boundaries - definite benefit should mutual aid be called upon."

Q11 If you have any further comments that you wish to make about tools, methods or guidance that you believe could contribute to improving Multi Agency Flood Plans please add them to the box below.

The flood warning area maps
Inundation and depth maps
Impacts on critical infrastructure and knock on effects to the community

The ability to run real time/forecast (so what scenario?) flooding areas and consequence animations would greatly benefit strategic and tactical commands.
Tools and guidance are of use; however, there comes a point when local information has to be collected and put into the plan.

The level of information required in the MAFP should be balanced against making a document too unwieldy (i.e. exercise/training information does not need to be included in an operational plan)

Clear and resilient communication paths for national, regional, area and local flood forecasting and response information.

In my experience during emergency flooding situations and training exercises taking the 'plan' off the shelf or out of the cupboard can be a bit of an afterthought. There needs to be a way of ensuring that all participants use the plan as this will provide continuity of approach and alleviate double handling of tasks.

The checklists should be less prescriptive, and allow for local knowledge/experience to be accounted for. There should be a realisation that every eventuality cannot be planned for and generic response arrangements can be used by competent people to deal with situations.

Some areas have a much less risk of flooding so the detailed planning required by the checklists may not be proportionate.

Flooding is only one of a range of potential emergencies that we have to plan for

Flood Watches (soon to be Flood Alerts) and Flood Warnings need to explicitly state which area they refer to. Sometimes it can be confusing as to which these locations relate, especially for people who may be involved in the response to flooding but aren't involved in flooding work on a regular basis.

It would also be useful to have more information about the fluvial system across the region, not just our county. For example, flooding in Nottinghamshire is greatly influenced by the situation over the border in Derbyshire."

Clear, targeted information for emergency responders which triggers at a level that has impact for an appropriate response

Applicable to any incident, access to a single mapping tool for use by the partners to identify risks and threats within an area (vulnerable, critical sites etc) and to put key information - evacuation routes, rest centres Forward control points etc would improve the response

I feel there is a lack of guidance or consideration about exactly how the plan will be used in practise. If a County had a dozen communities experiencing flooding, how practical is the current layout in order to assist the commander in making decisions. There is great reluctance from utility companies to share data on assets and their vulnerability to flooding, partially because they do not have the information on their risk ('well it depends how much rain falls' etc), but mainly because they just don't see what the LRF would do with the information. They are concerned that stating a site is at risk will either result in the gold/silver command taking unilateral action without consulting them, or alternatively will put pressure on them to take action to reduce the risk before it floods. Either way, the benefits have yet to be fully explained, and thus the key infrastructure remains a struggle to obtain.

The DEFRA guidance and templates were excellent tools

I think there should be guidance on writing different levels of flood plans. In Staffordshire we used the national guidance for our Strategic plan, but we have had to create our own for Tactical level plans.
For an LRF MAFP there needs to be the 'power' available to ensure all represented organisations participate in its development and maintenance.

Clearer guidance on evacuation responsibilities would assist development of this section.

Who bears the costs of the development of this plan?

Flooding differs from many other emergencies in that clear decision making requires (especially in its early stages) a background understanding of the physical characteristics of the geographical area, integration of past lessons learned about where flooding occurs and understanding of the warnings and resources available via the Environment Agency. The key task of a MAFP is to give this data concisely, easily understood (charts, maps etc) - you cannot assume that all key officers will be at same standard regarding understanding and regarding the above. Once a situation occurs where evacuation etc may happen, it is important that the plan makes clear 'who does what' and again, gives clear indications of the agreed policy for dealing with this. It should not reiterate existing response plans - just highlight where flooding is different - e.g. refer to list of buildings available for use as holding areas (most Local Authorities have these) but use the flooding mapping to check they are not within flood outline - or similar wording.

I wish to restate my belief that tools, methods or guidance should be simple, without being simplistic, meaningful and appropriate.

My overall feeling is that the Environment Agency on a regional and local level could and should take a far stronger role as hands on facilitators of this work. They have far more experience of producing flood plans and responding to flooding than Local Authorities and this knowledge based on lessons learnt is not being

utilised. The support from the Environment Agency is lacking at a local level- as a Local Authority Emergency Planning Unit we cover a number of local authority areas - if we want to use GIS we have to either approach each separate council to produce mapping products resulting in non-standard maps being incorporated into the plan or somehow try and synchronise data from all authorities into an in house GIS which then results in issues around data licensing particularly for populations/number of residences etc. The Environment Agency is far better skilled and resourced to undertake this work.

Appendix I Results of French survey

Table I1 Please indicate the level of usefulness of the following information, if it were available, in assisting you with the drawing of flood management plans (Q4)?

Percentage of responders for each "level" of usefulness	An assessment of potential injuries and loss of life for a range of flood scenarios	The "accessibility" of inundated roads ... for different scenarios	An assessment of potential damage to critical infrastructure	An assessment of the optimum location of shelters and rest areas	An assessment of other hazards triggered as the result of flooding	An assessment of the probability of buildings collapsing during a flood	An assessment of the optimal evacuation routes from the inundated area	An assessment of the time to evacuate people from areas at risk of flooding	An assessment of how improvements in the dissemination of flood warnings could reduce the risk to people	An assessment of the optimum location of shelters and rest areas
1 = "Not useful"	9%	3%	3%	3%	5%	6%	5%	4%	4%	6%
2	10%	0%	4%	4%	0%	10%	4%	4%	13%	4%
3	13%	3%	14%	13%	14%	**27%**	18%	12%	20%	22%
4	21%	12%	24%	34%	26%	25%	32%	25%	26%	22%
5 = "very useful"	**45%**	**83%**	**55%**	**37%**	**54%**	**27%**	**36%**	**54%**	**33%**	**43%**
0 = don't know	1%	0%	0%	9%	0%	4%	4%	1%	4%	3%

Table I2 **Please indicate what you believe is the most appropriate level of detail for the following information and data in flood emergency plans (Q6)?**

Percentage of responders for each "level" of detail	Flood warning lead times	Flood map showing flood extent	Flood map showing depths, velocities and flow routes	Flood risk to people in terms of potential injuries and loss of life	Flood risk to properties	Impacts of floods on critical infrastructure	Evacuation routes and times	Potential for other hazards that may occur because of flooding	Shelters, rest areas and safe havens	Implementation of measures (e.g. sand bags, temporary defences)	Availability of the appropriate resources
1 = Not detailed in the plan	0%	0%	0%	6%	6%	2%	3%	0%	3%	9%	1%
2	6%	0%	4%	16%	13%	5%	6%	9%	9%	7%	10%
3	16%	10%	10%	**28%**	30%	14%	26%	**37%**	15%	33%	13%
4	34%	28%	41%	25%	**36%**	38%	**35%**	26%	29%	**35%**	32%
5 = Very detailed	**40%**	**62%**	**45%**	22%	14%	**42%**	29%	26%	**44%**	13%	**43%**
0 = Don't know	4%	0%	0%	4%	0%	0%	0%	1%	0%	3%	0%

Table I3 **Please indicate what you believe is the most appropriate level of detail for the following issues related to communication, responsibilities and assumptions in flood management plans(Q7)?**

Percentage of responders for each "level" of detail	Aims, objectives and assumptions of plan	Target audience of plan	Details of modifications to and updating of the plan	Plan activation (e.g. trigger levels etc)	Communication with other agencies	Communication with the public	Communication with the media	Relationship with complementary emergency management plans	Details of recovery	Training and exercises
1 = Not detailed in the plan	3%	0%	4%	1%	3%	0%	4%	3%	7%	3%
2	6%	4%	21%	4%	6%	4%	10%	9%	18%	6%
3	**40%**	16%	**46%**	18%	**32%**	30%	**40%**	**34%**	**34%**	**49%**
4	30%	**49%**	22%	29%	32%	**33%**	25%	28%	31%	31%
5 = Very detailed	19%	30%	6%	**47%**	25%	**33**%	19%	26%	9%	12%
0 = Don't know	1%	0%	0%	0%	1%	0%	1%	0%	0%	0%

Appendix J Results of the Dutch survey

Table J1 **Please indicate which level of detail following information and data in a Multi Agency Flood Plan should have?**

Percentage of responders for each "level" of useful	**Potential injuries and loss of life for a range of flood scenarios**	**The accessibility of inundated roads to emergency services and other vehicles for different flood scenarios**	**Potential damage to critical infrastructure**	**The inter-dependencies between at risk critical infrastructure**	**Other hazards triggered as the result of flooding**	**Probability of buildings collapsing during a flood**	**Optimal evacuation routes from the inundated area**	**The time to evacuate people from areas at risk of flooding**	**How improvements in the dissemination of flood warnings could reduce the risk to people**	**Optimum location of shelters and rest areas**
Not useful	6.9%	6.7%	0.0%		0.0%	3.5%	0.0%	0.0%	0. 0%	0.0%
1 = Low level of detail	3. 5%	0.0%	0.0%		3.6%	13.8%	0.0%	0.0%	0.0%	3. 5%
2	10.3 %	13.3%	0.0%		7.1%	13.8%	3.3%	3.3%	13.8%	6.9%
3	17.2 %	16.7%	26.7 %		25.0 %	**34.5%**	16.7%	13.3%	24.1%	20.7%
4	**34.5 %**	13.3%	33.3 %		**39.3 %**	24.1%	26.7%	**26.7%**	20.7%	**41.4%**
5 = High level of detail	27.6 %	**46.7%**	**40.0 %**		25.0 %	6.9%	**53.3%**	56.7%	**34.5%**	27.6%
0 = Don't know	0.0%	3.3%	0.0%		0.0%	3.5%	0.00%	0.00%	6.90%	0.00%

Percentage of responders for each "level" of useful	Prediction times	Size of flood area	Water depth, flow velocities and VERLOOP of flood	Potential damage maps	Risk maps	Effect of the appliance of measures (temporal levees, sand bags)	Availability of resources
Not very useful	0.00%	0.00%	0.00%	6.90%	0.00%	0.00%	0.00%
1 = Low level of detail	0.00%	0.00%	0.00%	6.90%	3.57%	3.33%	3.45%
2	3.33%	0.00%	0.00%	13.79%	3.57%	13.33%	6.90%
3	10.00%	13.33%	10.34%	**34.48%**	25.00%	20.00%	**31.03%**
4	33.33%	36.67%	**55.17%**	24.14%	**46.43%**	**30.00%**	17.24%
5 = High level of detail	**53.33%**	**50.00%**	34.48%	13.79%	21.43%	**30.00%**	**31.03%**
0 = Do not know	0.00%	0.00%	0.00%	0.00%	0.00%	3.33%	10.34%

88% of the responders said that if they had the above information available to them, it would be useful.

- Generally, a higher level of detail is thought to be necessary for a MAFP.
- For the probability of buildings collapsing during a flood, potential damage maps and the availability of resources, a relatively low level of detail is assumed to be needed.
- For optimal evacuation routes from the inundated area, prediction times and the size of the flood area, the scores were most unanimous. Also, the highest level of detail is assumed to be needed for this information.

Q6: Is there other information that is used within your area or that you feel is a need for, and that is not yet mentioned in this list?
Status of the levees
Good overview of the (actual) strength of the levees
Insecurities of the forecasts of water levels and level of threat
Effect of public accessible information on the behaviour of the public
Overview of energy providers with an area overview of where they are active
Overview of drinking water providers with an area overview of where they are active
Overview of usable roads (estimation) after a flood (per worst credible flood scenario)
Number of inhabitants
Environmental effects that are flood specific (galvanisation companies can be a threat)
Vital objects such as the objects from KLPD, RIVM, KNMI, RWS, etc.
Uniform methods for determination of the shelter capacity for refugees in municipal locations.
For people that can (hardly) save themselves during a flood, no useful standard exists for shelter and care.
Definition of Herkomstgebieden and Bestemmingsgebieden (??)
National plans are unclear
The safety regions at this point can not say much about evacuation routes and shelter, because this is regulated on a higher level. The ministries however do expect that the regions can say something about this, although their plans are far from final.

Information from crisis partners
Integrality between the (sub)plans of several (bordering) regions and multidisciplinary components.
National developments with regard to larger scale floods like the National Draaiboek (??) for Floods
Organization and coordination of cooperation aid providing organizations and governments
Disaster management plans of the waterboards are not mentioned as a separate category in this survey

Communication, responsibilities and assumptions

Please indicate what you believe is the most appropriate level of detail for the following information and data in a Multi Agency Flood Plan?

Current usage of tools to inform Multi-Agency Flood Plans (% of responders)	**Aims and assumptions**	**Target audience**	**Planning of update and version management**	**Plan activation**	**Communication with other agencies**	**Public information**	**Communication with media and media watching**
1 = low level of detail	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	4.76%
	20.00%	0.00%	10.00%	5.00%	0.00%	4.55%	0.00%
	30.00%	40.00%	**45.00%**	10.00%	9.09%	27.27%	19.05%
	45.00%	**50.00%**	25.00%	30.00%	**50.00%**	**36.36%**	**42.86%**
5 = high level of detail	5.00%	10.00%	15.00%	**55.00%**	40.91%	31.82%	33.33%
0 = no opinion	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Current usage of tools to inform Multi-Agency Flood Plans (% of responders)	**Relationship with complementary emergency plans**	**Recovery**	**Training and exercises**	**Organisation (responsibilities and command)**	**Action plans, e.g. evacuation**	**People and resources**	**Reporting / evaluation of event**	**Flooding scenarios and uncertainty**
1 = low level of detail	4.55%	9.52%	4.76%	0.00%	0.00%	0.00 %	9.09 %	4.76%
	0.00%	9.52%	19.05%	0.00%	13.64%	14.29 %	9.09 %	4.76%
	36.36%	28.57%	19.05%	9.09%	27.27%	23.81 %	**40.9 1%**	19.05 %
	50.00%	**47.62%**	**33.33%**	36.36%	**31.82%**	**52.38 %**	27.2 7%	33.33 %
5 = high level of detail	9.09%	0.00%	19.05%	**54.55%**	27.27%	9.52 %	13.6 4%	**38.10 %**
0 = no opinion	0.00%	4.76%	4.76%	0.00%	0.00%	0.00 %	0.00 %	0.00%

- Generally, a higher level of detail is thought to be necessary for a MAFP.
- For planning of update and version management of the plan and for reporting and evaluation of the event, a relatively low level of detail is assumed to be needed.

- For plan activation, organisation and people and resources, the scores were most unanimous. These are also the metrics that scored in general the highest in the Dutch disaster management plans.

Effectiveness of Flood Plans

The Netherlands
Organisation, command, responsibility
Responsibilities well defined in the plan
Communication between involved parties well described
Clear command structure
Upscaling of the plan is clear
Command structure for making plans and execution of the plans clear
Clearly define roles and tasks of involved parties
Cooperation of involved parties during the construction of a plan
Clear command structure
Well organized communication
Communication
Synchronization between involved parties, other regions and ministries
Clear time lines
Organisation
Synchronization between involved organizations
Coordination of synchronization between responsible authorities
Clearly defined actions

Information/knowledge
Different scenarios available
Insight in inundation (velocity, water depth, flow velocities)
Insight in chain effect areas
Illustrative: get a good understanding of the threat
Reliable prediction

Insight in evacuation possibilities
Insight in shelter possibilities
Zicht op redden (???)
Focus on safety
Focused on the creation of boundary conditions for the ability of the population to save itself

Focus on measures for the preservation of economy and infrastructure
Perspectives for action taking (handelingsperspectief)

Focused on specific areas

Information availability during event
How quickly the (most recent) information can be delivered
Information supply/information systems
Netcentric working (??)

Readability and accesibility
The plan must be readable and it must be quickly consultable
Accesible
Kept in a logical place
Simplicity/clarity
Concise

Training
Exercise, training and education
Exercise of the plan
Plan must be well known (bekendheid)
How well the disaster plan is trained with

Decision making
Criteria on which the decision making process is based
Correct information on which decisions can be based

Up to date
Up to date (actualiteit)
Up to date

Communication
Communication to the public well described
Communication plan

Other
Attention for prevention
Connection between relevant plans/functional columns (functionele kolommen)
Implementation in the involved organizations
Prompt and reliable warning
Useful under other disaster conditions